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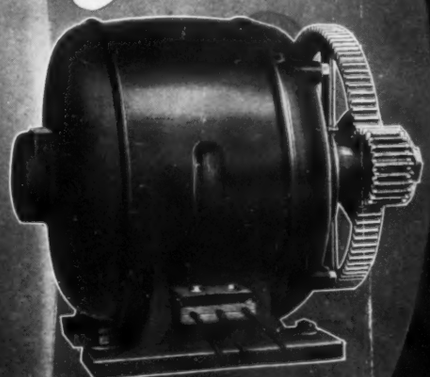

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Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

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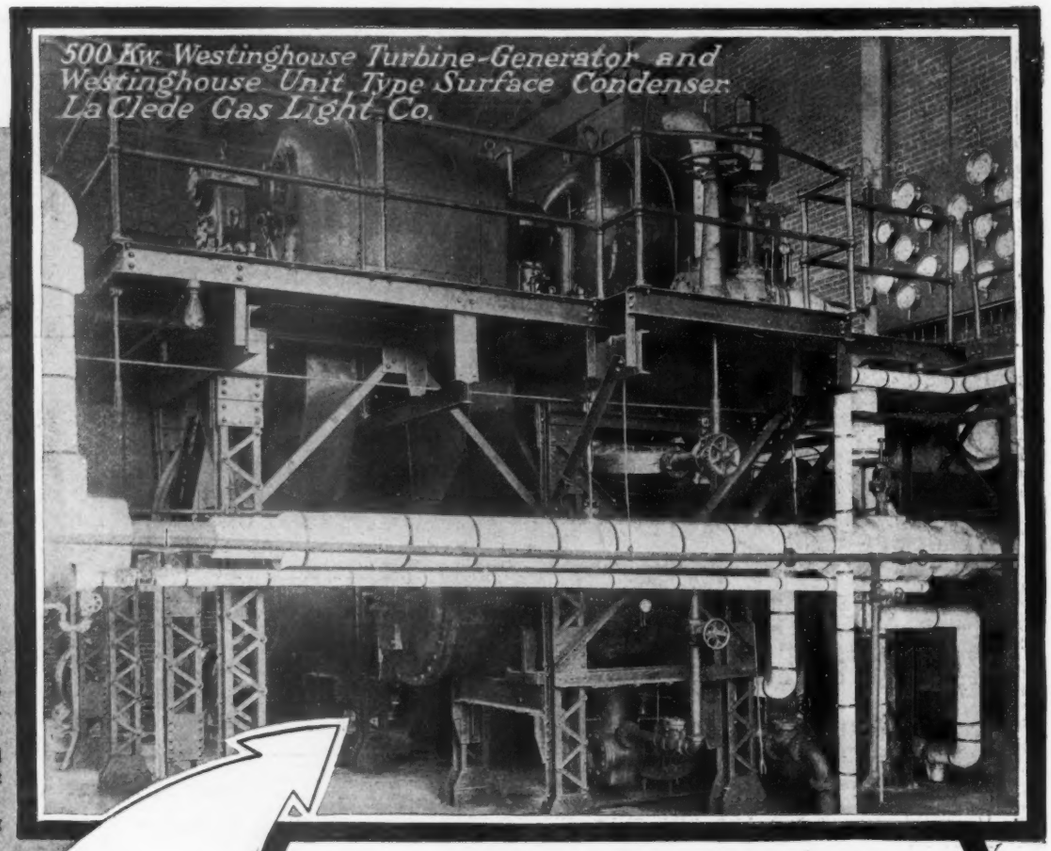

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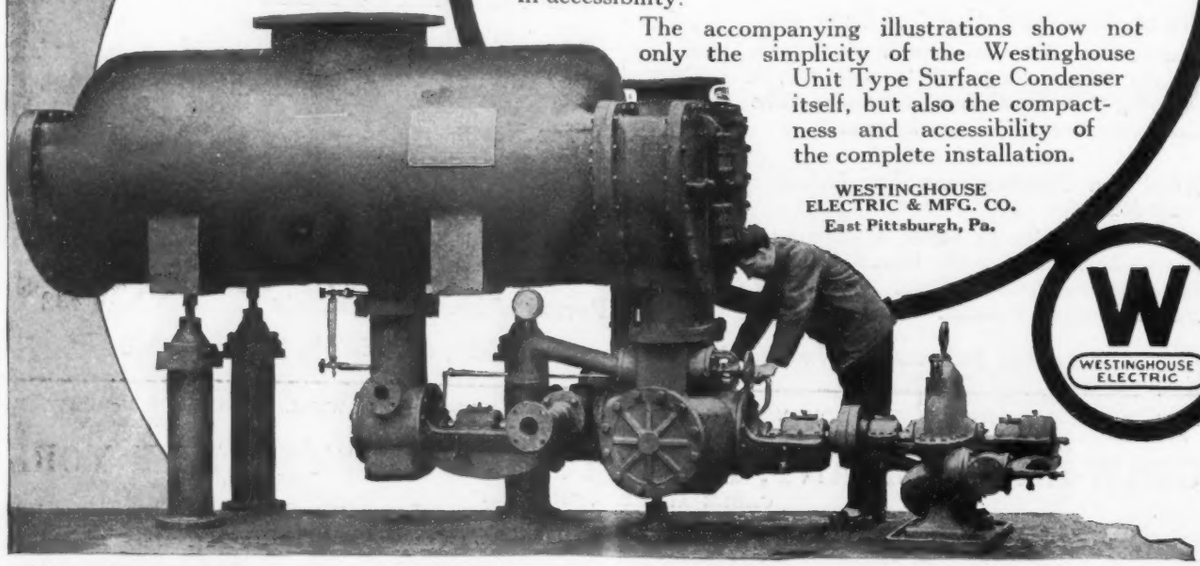

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, August 31, 1918 *Number* 9

Still Debating on Water Power

ALTHOUGH another summer will soon pass into oblivion without any apparent action on water power, there is every reason to hope that the needed legislation will be forthcoming before the year is over. So acute has the power situation become and so serious will our future outlook for coal be that action cannot by deferred much longer. It has taken a long while to educate the public to a proper understanding of the water-power problem, but happily the public has been quicker to grasp it than Congress, and therein lies the hope for early action. One administration after another has tried its persuasive powers on Congress without effect. President Roosevelt endeavored to get something done with our wasted water powers and President Taft continued the work, but Congress thwarted the desires of both. The problem was then passed on to the Wilson administration, but President Wilson during his first term of office was no more successful than his predecessors. In his message to Congress in December, 1914, the President reminded the legislators of their lethargy as follows:

"We have year after year debated, without end or conclusion, the best policy to pursue with regard to the use of the ores and forests and water powers of our national domain in the rich states of the West, when we should have acted; and they are still locked up. The key is still turned upon them, the door shut fast at which thousands of vigorous men, full of initiative, knock clamorously for admittance. The water power of our navigable streams outside the national domain also, even in the Eastern States, where we have worked and planned for generations, is still not used as it might be, because we will and we won't; because the laws we have made do not intelligently balance encouragement against restraint. We withhold by regulation.

"I have come to ask you to remedy and correct these mistakes and omissions, even at this short session of a Congress which would certainly seem to have done all the work that could reasonably be expected of it. The time and the circumstances are extraordinary, and so must our efforts be also."

The words of the President were spoken almost four years ago, but are just as true to-day as the day on which they were uttered. In fact, read in the light of current events they acquire added weight and force. Evidence is not lacking therefore that the attention of Congress has been called to our wasted water powers repeatedly, and the question for each representative and senator to decide for himself is whether or not he can afford to ignore longer the warning or the growing clamor for remedial legislation.

Electrical Supplies for the War

IN THIS issue we publish an authoritative statement from the War Industries Board on the question, vital to the manufacturers of electrical supplies, of what preferential rights to raw materials the demands of the extensive national war program will leave for their essential requirements. This statement, giving in precise terms the general views of the War Industries Board, in effect appears to supplement or supplant the formal ruling of the priorities division in Circular No. 4 so far as that ruling applies to the electrical supply manufacturers. Under that ruling automatic classifications were allowed on orders for materials, equipment or supplies for a number of specific uses, the one touching particularly the electrical supply manufacturing industry being as follows: "(j) For manufacture of electrical equipment other than turbines (but not electrical supplies as distinguished from equipment), B-2."

With the promulgation of this ruling and in the belief that in some way the fact had been overlooked that many electrical supplies are absolutely essential in necessary war construction, the War Service Committee of the Manufacturers of Electrical Supplies took steps to present the conditions again before the Washington authorities. The first announcement concerning these important negotiations, as published in last week's issue of the ELECTRICAL WORLD, was the letter from A. W. Berresford, as chairman of that committee, asking the respective chairmen of the group committees to take immediate steps to perfect the coöperative and conservation program desired by the War Industries Board. This work the committees are now doing as rapidly as possible, and in the meanwhile the board has made the restrictive decisions which are printed elsewhere in these columns.

The case of the electrical supply manufacturers, who must have an uninterrupted stream of raw materials if they are to produce the supplies urgently needed from them in the war program, really goes back to two main points. The first, which we believe they now have clearly established to the complete satisfaction of the War Industries Board, is that a certain propor-

tion of their output is indispensable in virtually all government construction work. The second is that unless they have authority and assured materials to manufacture for stock they cannot have in readiness to furnish promptly, either directly or indirectly through the far-reaching and successful jobbing system in the industry, the lines of supplies required in all sections of the country.

The supply manufacturers are not only willing but anxious to meet the government requirements, and they will accept with patriotic readiness whatever sacrifices are asked in attaining that end. So far as their production is properly classified as essential, they want to have full and fair recognition given to their material needs. When the quantities or classes of their production, as appraised in the light of the war revision, pass beyond the boundaries of what is essential, they ask only the same consideration, if any, that is given to other industries similarly situated. No business men appreciate better than do those in the electrical manufacturing industry the pressing urgency that all things shall be subordinated to the national aim, and none will be more ready to accept and do their part. In this position the jobbers, who are affected by the arrangement with the manufacturers, will coöperate heartily in the sincere wish to do their share patriotically.

The Principles of Rate Making

THE theory of rate making by electric supply companies has been the subject of immense discussion with comparatively small results. A certain section of the public thinks that it is unprincipled at best, while those who have to fight for the annual balance sheet in these days of rising costs have little in the way of definite data on which to fix a policy. Between the two come the commissions, with large powers and no very definite legal or economic basis for their operations. In this state of things the discussion of some of the fundamentals in the matter by Prof. John Bauer will be read with more than a passing interest. The chief question which here arises is whether cost of service or value of service should properly be used in determining rates. As far as supply companies are left quite to themselves, they take up the matter as in any other commercial business and have endeavored in the past to furnish service at a cost which would attract and not repel business and which would yet yield good returns. This is the principle broadly of charging what the traffic will bear, basing the prices, as in any other commodity, on those which will yield, all things considered, the best returns. This implies that forbiddingly high rates should not be charged and that in some way or other the rates should be proportioned to the value of the service to those who elect to take it. In the hands of far-sighted managers this policy has generally led to reasonable rates, as witness the keen comment of the late A. C. Dunham to the effect that every time he had lowered his rates he had increased his net profits.

It is undeniable, however, that at times charging what the traffic will bear has led to serious discriminations which from the standpoint of the publicist must be taken into grave consideration. Fixing rates on the basis of costs looks well at the first glance, but it is very difficult to carry out rigorously, and so much depends on the somewhat arbitrary distribution of costs in the bookkeeping that trouble from inequality of rates is likely to ensue. The commissions as a rule have followed the cost theory. The laws usually require reasonable rates and forbid discrimination. Both these requirements are somewhat vague, for reasonable rates can be defined only in terms of reasonable or unreasonable rates of profit, and discrimination based on costs may be as burdensome as that based on charging what the traffic will bear. The elements of cost are so variable and so numerous that evaluating them fairly is almost out of the question. What has been done in practice, as a rule, has been the somewhat arbitrary assumption of certain conspicuous elements in cost as the variables while the other factors are taken by general average. The maximum demand, as Professor Bauer indicates, has been largely used in determining the cost of service, but the time of the demand, involving its relation to the peak, and the place of demand, involving the distance from the station, are almost always taken by general average, although in many cases more important than the maximum demand itself. There is, therefore, a very natural inclination on the part of the commissions to base the reasonableness of the rates on the return to the corporation. Considering the fact that electric supply is generally recognized as a natural monopoly and that all the tendencies have been toward the elimination of competition instead of its encouragement, this attitude is not an unfair one. Electric supply companies make their earnings in virtue of public franchises and security in monopoly given by public consent. As a rule, therefore, they are not in a position to object to public regulation, and more and more are regarding themselves as public servants with a duty to the community as well as a duty to their stockholders, an attitude which certainly makes for fair dealing all around. Ultimately, then, public regulation comes around to the basis of insuring such fair return on the investment as will encourage good service and an extension of facilities, on whatever theory the original legislation may have proceeded.

One interesting question raised by Professor Bauer is the disposition of excess profits as related to the establishment of rates. Obviously if rates were established on the basis of what the traffic would bear and pushed rigorously toward that limit, the chances are that, since electric service now partakes of the nature of a necessity, the profits could be made to reach a figure which the commissions would regard as unjustifiable in view of the participation of the community in the matter of franchises and protection against competition. If the community freely gives up the idea of competition and protects from it the public service corporation, it certainly is entitled to consideration on this account. Professor Bauer's query is whether it may not be advisable to let rates run beyond the point which would be established merely by a fair return on the investment and then, while allowing this fair return, confiscate the rest for the general good of the public. If this plan were followed, the users of electric light and power would simply be contributing a certain amount to the public funds instead of themselves getting the benefit of it in the form of lowered rates.

This matter involves a very broad question of economic policy. Our view of the case is that electric service at present is so near to a general necessity that public participation in the form of lowered rates is fairer than the turning in of excess profits for miscellaneous use. If only a small part of the community gained the benefits secured by the franchises of the whole community, a good case could be made out for the excess profits plan. Such in fact does not seem to be the situation, so that the now very frequent plan of determining the fairness of rates by just return on the capital will continue to be the preferable one. The commissions are disposed somewhat uniformly to take this view and to provide fairly for proper upkeep of the company and improvements to better public service. At the present time they have to consider the raising of rates in order to cover greatly increased costs both of material and labor, and they have approached this subject on the whole in a fair and open-minded fashion. As a matter of fact, it is total costs to which they chiefly look, so that the general policy in respect to the matter may now be considered as fixed on the cost basis, whatever advantages there may be in the opposite policy.

Electrical Engineering and the Food Supply

THE prospects for adding to the world's food supply by means of electric power is a subject of world-wide importance. Based on food statistics, it is claimed that if the total food supply of the world were evenly divided among all the inhabitants, the individual share of proteids or nitrogen constituents would be one-third less than the quantity agreed among bio-chemists to be sufficient for maintaining full strength; namely, about 20 grams of nitrogen a day per adult. Consequently, at the present time slow starvation is a very widespread cause of destruction of the race. Chemically considered, plants are necessary for the production of all our food, animal food being merely plant-produced food held in suspension. Plants require for their growth, among other things, nitrogen, phosphorus and potassium. The greatest need is ordinarily for nitrogen, notwithstanding the fact that plants and animals alike live at the bottom of an atmospheric ocean in which nitrogen is by far the largest ingredient. The nitrogen carried away from the land in the crops is renewed, in the regular course of natural phenomena, only slowly; so that intensive farming demands fertilization with assimilable nitrogen. These nitrogen fertilizers from known nitrate deposits are tending toward rapid exhaustion.

In all parts of the world the cost of food is rising, owing to the rapid growth of population. In the last hundred years the world's population has nearly doubled. As countries increase in size they tend to drain their local food stocks and seek grain elsewhere. The advantages of greater average wealth, comfort and possessions which should have accrued to the world's inhabitants during the last century by reason of the marvelous advance in machinery, science and arts bid fair to be all consumed in merely keeping a larger population existing at the old rate of average poverty.

Fortunately, the application of electricity to producing plant-food nitrogenous substances from the air has made enormous strides, the machinery so occupied having increased from 150 kw. in 1903 to approximately ten thousand times that. Nevertheless, this machinery can at present supply only a small percentage of the nitrogen in the world's annual cereal crop. After all of the nitrate deposits in the world shall have been exhausted it would appear that nitrogen fertilizers will have to be produced by electrical engineering from water power. We must either expect the nitrogen, phosphorus and potash plant foods to be greatly increased, or the struggle for existence will eventually have to maintain the necessary balance of surviving numbers. A fine field therefore lies open to chemists and engineers for producing the required chemical plant foods with the minimum expense of energy and labor.

Checking Engineering Estimates

IT HAS sometimes been said in criticism of engineers as a class that they are inclined to underestimate the cost of new projects; but that is a frailty of human nature in general and not a characteristic peculiar to engineers. When estimating on probable costs it is easy to forget items of detail which in the aggregate amount to a great deal. On that account the only safe course for the engineer to pursue is to check his summarized detailed estimate with figures obtained from experience with similar work elsewhere. Detailed estimates are not to be despised. As between the engineer who inserts details in his estimates without checking his final results and the engineer who cuts out much of the detail and calculates by means of total results per unit with figures derived from ample experience the latter is far less liable to estimate too low and incidentally gets his results quicker. The mistakes he makes, if any, are attributable to abnormal costs of some details of the work. Too much delving into detail oftentimes causes the estimator to lose sight of the broader aspects of the situation. Engineers have been known to figure the cost of some details down to fractions of a dollar and make rough guesses on the larger quantities involved, resulting in a large per cent of error. A proper perspective is all that is lacking.

The Coming Issues

DEVELOPMENTS at Washington are of large significance to the industry in these days, and they will be outlined with the same watchful care which has characterized the reports of past activities in that important center. In the further study of rate questions a second article by Prof. John Bauer will appear as a conclusion of his discussion of "Cost Versus Value of the Service." Other articles which deal not only with the rate issue in war time but also with the future of this question in central-station management will be printed. An article which will be published in an early issue discusses the development of 2500-volt fuses.

Cost Versus Value of Service in Rate Making—I

Discussion of Fundamental Purposes and Factors That Must Be Considered in General System of Public Utility Control—Charging "What the Traffic Will Bear"—Popularity of Cost Rates

BY PROF. JOHN BAUER
Princeton University

TO WHAT extent should cost or value of service be used in the determination of electric rates? To answer this question, others must first be raised as to the fundamental purposes and factors that must be considered in a general system of public utility control.

First, what is the fundamental purpose of rate regulation? Public utilities are monopolistic industries furnishing essential public services. The monopolistic nature has become so extensively recognized that not only has the attempt to enforce competition been given up, but monopoly is being protected and fostered by law. But under these circumstances, to prevent excessive private gains, the law has provided for the regulation of rates.

The public utility laws almost generally require reasonable rates and forbid discrimination. But they do not define, except in vague terms, what are reasonable rates and how they shall be determined. Then arises the more precise question, whether the primary purpose of the law is really to fix rates or to restrict the return on capital invested in a public and monopolistic service. Is the chief object to protect the consumers, or to prevent excessive earnings in essential non-competitive enterprises?

The view that is commonly expressed by the public service commissions in rate cases is undoubtedly the former. The assumption is simply that, by right, rates should be fixed at cost including all operating expenses, taxes and fair return on investment, and that rates in excess of such cost are therefore unreasonable. But this view is more easily stated than applied. Even in the simplest utilities, rough approximations have to be made in establishing cost rates. In the more complex utilities, while the total revenues collected through rates may be substantially adjusted to the total costs, including fair return on investment, the distribution of the total costs among the different classes of consumers involves much more than merely a proper cost assignment. And in the extreme case of the railroads, even the adjustment of total revenues to total costs cannot be accomplished by individual railway systems, and cost simply cannot be taken as the basis of rates*.

RETURN ON INVESTMENT

In any rate proceedings, however, apart from the removal of clearly discriminating practices, the chief consideration in determining a rate schedule is the return on investment. If the revenues exceed a fair return, the rates are too high and are reduced; but if they are less, then the rates are too low and are raised. The standard of reasonable rates, therefore, is the fair return on investment. This clearly indicates that the fundamental purpose is the control of return, and not the fixing of reasonable rates as such. This is well illustrated by the increase in railroad rates recently announced by Director General McAdoo. Most of the advances amount to 25 per cent or more, and yet there is practically no opposition by the shippers or the public. Why? Partly, of course, for present patriotic reasons, but probably chiefly because the increases will serve the public and not private interest—which, too, is patriotism. Except for obvious discriminations, railroad rates have never been considered unreasonable as such. The opposition to the advances sought by the railroads from time to time in recent years has not been due to unreasonableness itself of the proposed rates, but rather to the unreasonable returns that would be obtained by many companies. There probably would have been no substantial opposition at any time if the advances had been on public and not private account.

If the view is correct that the primary purpose in rate regulation is the control of return on investment, we then face the question whether this control is better maintained through the adjustment of rates or by leaving the companies practically free to fix rates according to ordinary commercial considerations and then taking the excessive earnings above a fair return for public purposes. It would, of course, be unreasonable to allow a company more than a fair return in a monopolized public service. Whether the one method or the other for restricting the return be used must depend upon the circumstances of each particular class of utilities.

WHAT THE TRAFFIC WILL BEAR

Cost rates in themselves have no fundamental claims to reasonableness. Rates based on so-called value of service, or, as often stated, on what the traffic will bear, are not unreasonable *per se*. They are such as the masses of possible consumers will pay rather than substitute for or go without the service. Their purpose is to produce maximum profits and thus fix the greatest value for the business. They are the so-called monopoly rates or prices. But they cannot be arbitrary; they must have regard for the needs of the consumers, else they will result in less than the greatest profit or maximum value of the business. They must be carefully guarded so as not to charge more than the traffic will bear. The value of the service must be judged from the standpoint of the different groups of possible consumers, not according to single individuals, or the rates will not bring the maximum profits.

If the term "charging what the traffic will bear" is properly understood and is scientifically applied, there simply cannot be anything unreasonable in the rates themselves. Of course, business managers are always likely to attempt to charge more than the traffic will bear, and to introduce discriminating practices, which finally mean less than maximum profits. These matters

*See the writer's "Return on Public Service Properties," *Political Science Quarterly*, March, 1915; also "The Federal Valuation of Railroads in Relation to a Definite Policy of National Railway Control," *Proceedings* of Am. Econ. Asso., March, 1917.

should always be under the supervision of the commission. But if value of service rates are really what the traffic will bear, consumers have no clear ground for objection. The only unreasonable thing would be an excessive return realized by the investors.

COST RATES POPULAR

Whether the control of the return on investment should be exercised through cost rates or through value of service rates with excessive profits taken for public purposes depends upon the desirability and the practicability of fixing cost rates. In general, however, there does seem to be a natural feeling in favor of cost rates, and they probably should be applied unless there are clear reasons to the contrary. The question really turns on the practicability. Still, where service is used extensively by well-to-do and wealthy people, and very little by the poorer classes, there is no urgent reason for attempting difficult rate protection below what the traffic will bear, while there is good reason if the service forms practically a necessity to the poorer people.

Further, if the service is used in production, not in direct consumption, there would be little expediency in shielding the purchaser from the full value of the service, for the rates would form only part of the production cost, and a reduction might not benefit the ultimate consumer; and there would be little sense in fixing the price of one factor in production and leaving all the others, as well as the final product, to be determined according to market conditions. But if the service goes into direct consumption, then a reduction in rates actually benefits the final consumers, and it probably would be desirable, especially if the service goes to the poorer classes and if cost rates can be practically determined.

PRACTICABILITY OF COST RATES

The practicability of cost rates depends upon (1) whether there is a single service or at any rate few services whose costs may be clearly separated, or whether there are several services with a large proportion of joint costs; (2) whether there is a single locality or few localities whose costs may be separated, or whether there are many interdependent localities whose costs are merged and whose rates cannot be made independent of each other.

As to the first point, there is, of course, no public utility which strictly furnishes a single service. Still, practically, we may say, that a street railway performs only one service, passenger transportation, and its rates may be fixed according to cost. The total costs, including return on investment, may be divided by the number of passengers, and the result may be used as the proper rate, with a moderate allowance for contingencies. On the other extreme, the steam railroads furnish services of a thousand sorts, involving joint investment and expenses, so that even a rough determination of cost for each service becomes an impossible matter.

As to the second point, again no public utility strictly supplies only one locality. The same city usually furnishes so many different circumstances as to amount to different localities. Still, practically, in most instances of so-called local utilities, rates may be fixed on the same general cost basis within a city or a clearly defined similar area. But when several cities or widely separated areas are united by continuous service, so that there must be a network of interdependent rates, cost determination becomes an utterly arbitrary matter. Most of the costs are jointly incurred between localities; how shall they be apportioned? Rates must form a continuous system; how may that be accomplished?

DYNAMIC BALANCING OF ROTATING SECTIONS

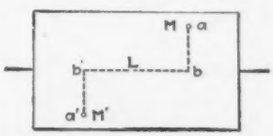
Simple After Static Balance Is Obtained—Rational Unit for Expressing and Measuring the Tolerance Allowed

BY CARL HERING

IT IS well known that a piece of machinery to be rotated about an axis, like an armature, a turbine rotor, an automobile or aeroplane crank shaft, may be balanced when placed on knife edges or between pivots—called static balancing—yet may be very much out of balance when it is rotated, especially when such rotation is rapid. Correcting the latter condition is called dynamic balancing.

In the latter case, if the piece has first been corrected with reference to static balance, it is always true that the dynamic balancing could be secured by adding or taking away two equal masses, equally distant from the axis and at a certain distance apart measured along the axis. In the diagram, for instance, let it be assumed that the piece is balanced statically yet unbalanced dynamically, then the latter could always be corrected by adding or taking away two equal masses M and M' at equal distances ab, $a'b'$ from the axis and at an axial distance apart L equal to bb'.

As it is often unnecessary and too expensive to carry this dynamic balancing to perfection, a certain small amount of lack of balance is permissible or tolerated,



MEANS OF PRODUCING DYNAMIC BALANCE

and this amount depends on the use to which the piece is put, its natural period of vibration, the pressure on the bearings, the strength of the shaft, etc., and largely on the speed of rotation. As this limit of tolerance must be capable of being stated in specifications and may be the subject of dispute, it is very desirable to be able to express it in terms of a definite and rational unit, instead of stating it, as at present, in loose, vague, almost meaningless terms which are not definite and admit of different interpretations. A tolerance stated in specific, clearly understood terms also eliminates the factor of the personality of the constructor and the particular "make" of machine. All makers who can work down to such a stated tolerance are then equally good in this respect. The purpose of the present article is to show what this rational unit should be.

Returning first to static balancing, it is evident that an unbalanced state can always be expressed in terms of a single resultant—namely, one definite excess of mass M at a definite distance D from the axis—but neither of these quantities need be known separately. All that is necessary is their product; that is, the

moment or torque. No matter what the speed is, this statically unbalanced condition can always be corrected by adding or taking away another mass m at another distance d, provided only that the two products or moments are equal; that is, that $md = MD$. This is important in practice as it is often more convenient to add or remove this mass at certain definite places where the distance d becomes fixed; the amount of the mass can then readily be adjusted so that the product md is the required amount.

Unit for Expressing Static-Balance Tolerance

The unit for expressing the tolerance or allowable lack of static balance is therefore the product of a mass and a distance. In the metric system it would be a centimeter-gram, and in the system of units which we have unfortunately inherited and must still tolerate it is the ounce-inch; that is, the product of ounces and inches. These two smaller units are preferable to the pound and the foot, because the latter are in most balancing cases such large units that inconveniently small fractions would have to be used. (1 ounce-inch = 72.008 cm.-grams; 1 cm.-gram = 0.013887 ounce-inch.)

Physically that which causes unbalance is a moment (a mass multiplied by a lever arm), but as our units of mass, like the gram, ounce, pound, etc., are also used very frequently to represent forces, and as in those cases their product with a length represents energy, like gram-centimeters, foot-pounds, etc., it becomes very desirable, in order to avoid confusion, to make a distinction between these two physically different products, and this is best done by expressing these moments in ounce-inches or pound-feet, and the energies as usual in inch-ounces or foot-pounds.

Hence the tolerance in static balancing may be expressed correctly and definitely in terms of the unit ounce-inch; and as the amount of permissible unbalance, other things being equal, decreases in direct proportion to the square of the speed, the stated number of ounce-inches should be accompanied by the speed to which it applies. According to N. W. Akimoff, who has made a special study of balancing, a fair limit of tolerance for the static balancing of such a piece as an armature weighing not over 200 lb. (90.7 kg.) might be about 0.4 ounce-inch (28.8 cm.-gram) for a speed of about 1000 r.p.m., or one-quarter of this for 2000 r.p.m., etc. This value, however, varies with the particular piece and the nature of the machine in which it is used. This means that there is 0.2 ounce (6.2 grams) too much at a distance of 2 in. (5.1 cm.) from the axis, or 0.4 ounce (12.4 grams) at 1 in. (2.54 cm.), etc., and that a mass of this amount at the corresponding distance must be removed or must be added diametrically opposite, in order to bring about perfect static balance. The limit in balancing is governed more largely by the permissible amount of vibration, the natural period of vibration of the machine as a whole, and by the pressures on the bearings, than by the bending of the shaft. It is also greater for heavier bodies.

Unit for Tolerance in Dynamic Balancing

Coming now to dynamic balancing, any lack of balance involves two moments or products md, like those in static balancing, but in addition there is the axial distance between them, L or bb' (see diagram). After balancing statically these two moments are necessarily always in the same axial plane and equal to each other, but only as moments, since the two excess masses and their radial distances may be different. The necessary condition is that their products are equal. Hence these moments themselves may again be expressed and measured in ounce-inches, and as they are always equal (after balancing statically), the same tolerance as to the moments themselves applies equally to each; hence only one of them needs to be considered in stating it.

A pair of such equal moments at a distance L apart, as in the cut, produces the unbalancing as when the moments are half as great but are twice the axial distance apart, or as twice the moments at half the distance apart. For the same moments the unbalancing is in direct proportion to the distance L apart. This distance therefore enters into the unit like the radial one; hence the correct unit to use in dynamic balancing is the ounce-inch-inch, which is a moment of a moment,* or a centrifugal couple. This form, however, leads to the tendency to write it ounce-inch^2, which would be misleading as it implies the squaring of one distance, instead of the product of two very different ones. Although they are both the same physical quantity—namely, a length—yet they differ as vectoral quantities, being different in their angular directions. Hence this unit might perhaps better be specified as inch-ounce-inch. or, in the metric system, as a centimeter-gram-centimeter. (1 inch-ounce-inch = 182.90 cm.-gram-cm.; 1 cm.-gram-cm. = 0.0054674 inch-ounce-inch.)

A permissible unbalance at 1000 r.p.m. would have to be reduced to a quarter for 2000 r.p.m; that is, it is again inversely proportional to the square of the speed. Hence a standard tolerance in dynamic balancing must also state the speed to which it applies. When unbalancing is stated in terms of these specific units, it is a simple matter to determine by trial how much tolerance in unbalancing may be permissible with any particular machine, if there is available one that is perfectly balanced. One need merely temporarily to attach two equal known weights at equal known distances from the axis, on opposite sides, and at a known axial distance apart; then increase these weights or distances until it is found that the vibrations or bearing pressures become excessive.

According to Mr. Akimoff, a fair limit of tolerance for the dynamic balancing of such a piece as an armature might be about 12 inch-ounce-inches (2190 cm.-grams-cm) for a speed of 1000 r.p.m., or a quarter of this for 2000 r.p.m, etc. This value, too, varies with the particular piece and its uses. He has found that quantities as small as one-third or one-quarter of these suggested tolerances can easily be detected by a well-built machine intended for measuring the amounts of unbalance.

Dr. Akimoff, who has made a special study of balancing and is carrying it out in practice, more especially in difficult cases, is using the above-mentioned units in his work and finds them to be satisfactory in every way. The writer is indebted to him for reading over and approving the statements that are made in this article.

*In the C. G. S. system this quantity has the same dimensions as a moment of inertia.

New Industrial Lighting Code for Wisconsin

Old Code Is Discarded on Account of Vagueness—New Rules Define Terms Used and Provide for Definite Values of Illumination and Glare—Experts Aid in Revision

BY JOHN A. HOEVELER,
Illuminating Engineer, Industrial Commission of Wisconsin

As a result of the appointment of an advisory committee to consider the revision of shop-lighting orders of the Industrial Commission of Wisconsin, a new code was adopted which is much more specific in its provisions and thus more readily understood and enforced. All technical terms used are defined for the benefit of factory superintendents. More definite specifications provide for adequate light distribution for various classes of work, taking into account daylight as well as artificial illumination, and, for the elimination of objectionable glare, the brightest square inch of visible light source permitted is 75 cp. for overhead lighting and 3 cp. for local lighting.

In order that all interests might be represented and thus given the opportunity of advancing constructive criticism, the advisory committee was made up of ten members, including the superintendent of a lamp-manufacturing factory, the manager of a gas company, the illuminating engineers of a central station, of the city of Milwaukee, of the United States Public Health Service and of the Industrial Commission, the chief electrician of a manufacturing plant, the works manager of a manufacturing plant, an electrical contractor and an oculist.

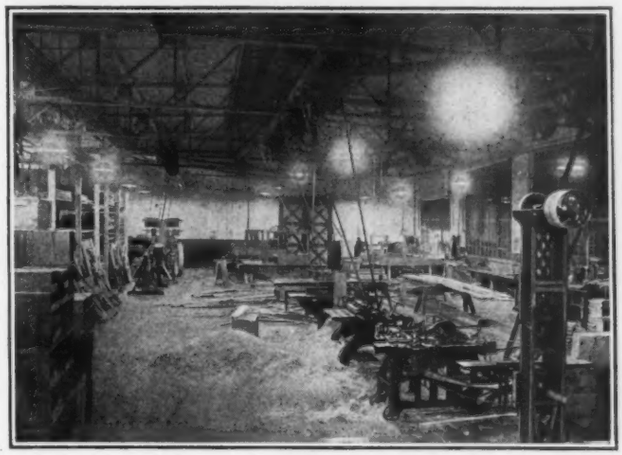
This advisory committee at its first meeting did little more than decide that the shop-lighting orders of the Industrial Commission, in effect since 1913, should be repealed and an entirely new code adopted, patterned after the Illuminating Engineering Society "Code of Lighting for Factories, Mills and Other Work Places," and the similar codes of Pennsylvania and New Jersey. It was also decided to solicit the assistance of prominent illuminating engineers, both in and outside Wisconsin, and of the committee on lighting legislation of the I. E. S., of which L. B. Marks of New York is chairman. The committee expresses its indebtedness to T. F. Foltz of the Department of Labor and Industry of Pennsylvania, Lewis T. Bryant, Commission of Labor of New Jersey, Francis A. Vaughn of Milwaukee, Arthur J. Sweet of Milwaukee and the above committee of the I. E. S. for much valuable information.

The 1913 shop-lighting orders were repealed because they employed a unit of illumination intensity "which does not definitely specify the quantity of illumination which must be received at the work and fails to meet the requirements of a proper code of lighting in the following respects: (1) Insufficient distinction is made as to the requirements for different classes of work; (2) requirements in some instances are too low; (3) requirements are indefinite in that they sometimes do not specify a particular intensity of illumination, apparently leaving the selection to the employer."

Concerning the proposed new orders, the committee recommended that "the scope of the new orders be extended to include all portions of industrial plants—(1) roadways and yard thoroughfares; (2) stairways, passageways, aisles, storage spaces; (3) manufacturing spaces; (4) offices.

The parts of the new code, as recommended by the committee, which differ from provisions of other industrial commissions are specified as follows:

The new lighting code differs from the 1913 orders and many existing codes in that it defines terms used, definitely specifies the intensity of illumination to be provided at the work for the different classes of work (the unit of illumination employed is the foot-candle), provision is made for adequate properly applied natural illumination (a feature other states have not adopted as yet), shading of lamps is mandatory under certain conditions which are recognized to be bad when lamps are permitted to be exposed, and thus provision is made to minimize glare, the distribution of light on the work must be reasonably uniform, emergency lighting is required, pilot or night lights and easily accessible control are specified, and maintenance is made mandatory.



LAMPS INSTALLED TO CONFORM WITH WISCONSIN CODE

The light distribution is uniform, the lamps being placed 9 ft. (2.7 m.) above the floor and 12 ft. (3.6 m.) apart to obtain this result.

The committee states as its opinion "that these orders, if adopted, will make it possible to secure lighting in industrial plants which will reduce avoidable accidents, and if the industrial commission, through its deputies, will urge employers to provide the intensities of ordinary practice, working conditions will be greatly improved to the benefit of both employer and employee."

Although the committee agreed that all new buildings preferably should be constructed so as to make proper provision for adequate natural lighting, it was also agreed that this frequently is impossible (no matter how much glass area may be provided) in congested districts. Therefore a general requirement (Order

2110) was worded so that either natural or artificial light may be used. Obviously it is to the advantage of the owner to utilize as much natural light as possible, and when the code is published by the industrial commission it is proposed to include an appendix which will point out the advantages of natural ilumination and briefly discuss economical means of securing it in adequate intensity, properly applied.

ILLUMINATION INTENSITIES SPECIFIED

The illumination intensities at the work, specified for different classes of service in Order 2112, are the same as recommended by the I. E. S. committee on lighting legislation, with the exception of "(d) Toilets and Washrooms," which was added at the suggestion of the writer, after having seen it included in a draft of proposed lighting standards for federal industrial establishments formulated by the Bureau of Standards. The committee felt that toilets and washrooms were important enough spaces in the industrial plant to warrant a separate specification, as all too frequently these are the darkest and most unsanitary parts of a factory.

The reduction of harmful glare with artificial lighting systems occupied much attention on the part of the committee. As mentioned by Prof. C. E. Clewell in the ELECTRICAL WORLD some time ago,* the Wisconsin advisory committee was of the opinion that the I. E. S. glare specification ("Lamps shall be suitably shaded to minimize glare") is too indefinite, and that a more definite rule would aid the inspectors who are called upon to determine when the limits of glare are exceeded. The glare specification, as embodied in Order 2113 ("Shading of Lamps for Overhead Lighting") and Order 2114 ("Shading of Lamps for Local Lighting"), is the outcome of correspondence with the I. E. S. committee on lighting legislation and a sub-committee which was appointed to investigate this matter and of which Ward Harrison was chairman.

The committee fully realized that the glare rule adopted may require revision after being tried out, but that is the reason the State of Wisconsin has abandoned making safety and sanitation laws by statute and instead has created an industrial commission and given it full powers to issue orders which have the legal force of statutes on these subjects. The state government realized that advances in industry bring about change in conditions of employment, and that an elastic method of dealing with such changes would be the only successful one. The I. E. S. continued the above mentioned sub-committee to coöperate with the Industrial Commission, and it is expected that this coöperation will result in gaining more information on this important problem. Although the advisory committee knew that there was not sufficient knowledge to state definitely the maximum allowable brightness permissible, it was convinced that the maximum set was not unreasonable.

Since opaque metal or mirror reflectors are chiefly used in the industries of Wisconsin, this requirement will insure good eye protection because of the fact that for locations coming within the scope of the rule reflectors which screen off all light within approximately 14 deg. below the horizontal of necessity will be used.

When glass reflectors are used they must be dense enough to reduce the brightness to less than 75 cp. per square inch. Light sources of lower brightness than 75 cp. per square inch, as, for instance, mercury-vapor lamps with a brightness of but 14.9 cp. per square inch, may be used exposed; but, as explained in the accompanying note, conditions of individual installations may require the shading of light sources of even such low brightness.

As regards the distribution of light on the work, the advisory committee considered the wording "a good distribution of light on the work" of the I. E. S. code too indefinite, and, as mentioned by Professor Clewell in the article previously referred to, several attempts were made to make the rule more definite. Finally the matter was settled by wording the rule as in Order 2115 ("Distribution of Light on the Work"). The term "reasonably uniform distribution," it was felt, would give the inspectors a better idea of what is considered satisfactory light distribution. Local lighting only is not permitted, except where the light from the lamps falls principally upon light surfaces and where the ceilings and walls are light, under which condition there is often sufficient general illumination.

The question of emergency lighting caused much difference of opinion among the committee members. All were agreed that some emergency lighting is necessary, but that the necessity varies much with the different industries, that large plants need it more than small plants, and that the character of emergency lighting which may be secured at reasonable cost varies considerably in different localities. A general rule (Order 2116) was agreed to, but it was considered essential that explanatory notes be included in an appendix to indicate what the Industrial Commission would consider satisfactory compliance with the order.

MAINTAINING THE EQUIPMENT

When all is said and done regarding the proper requirements of a lighting system, either natural or artificial, and the factory is properly equipped, of what use is the lighting if it is not maintained? To meet this objection, Order 2118 ("Maintenance") was included in the code. The committee realizes that this provision can be enforced much less rigidly than the others, because the Industrial Commission has too few inspectors to make it possible to visit all the factories at frequent intervals, as would be necessary if the maintenance of the lighting were to be checked up. In fact, an inspector at present can hardly cover his territory in a period of a year.† However, if when the inspector visits a plant, he finds the lighting facilities poorly maintained, he will be clothed with the authority to order a general clean-up and replacement of defective equipment. It is calculated that this will in time help matters, especially in view of the fact that the inspectors do their work in a coöperative way and spend

*"Changing Aspects of Factory Lighting Legislation," Vol. 71, No. 13, p. 666.

†The Wisconsin inspectors do their work in an intensive manner. Each factory inspected is given careful study. Meetings of the foremen are called, at which the unsafe practices of the plant are discussed and remedies suggested. The foremen are made to realize that it is their duty to instruct their men how to perform their work safely, to see that machines are guarded, that the shop is sanitary and that the many other requirements of the commission are carried out; that these requirements have been drafted by committees of practical shopmen and experts in various lines, only upon due consideration, and that as a result they represent what is considered a minimum to make the conditions of employment better. Consequently fewer factories are visited each year than if the work were confined merely to looking for violations of the commission's orders and issuing an order for the correction of the violation.

much time educating the plant superintendents and foremen in safety, sanitation, lighting, ventilation, welfare and supervision of male, female and child labor and in arbitrating disputes between employer and employee.

The various orders were read and discussed at a public hearing in Milwaukee, and practically no objections were raised. On the other hand, some favorable comments were expressed. On May 20 the Industrial Commission adopted the code, which took effect on July 1, 1918, for new construction and will be effective on July 1, 1920, for additions to existing lighting systems. Replacements of existing systems not in accordance with the code must be prosecuted as rapidly as circumstances permit. In the latter matter the Industrial Commission will exercise its best judgment as to how rigidly to enforce the provision. When these orders are published in bulletin form, which is being done now, it is proposed to include an appendix which will discuss each order in detail and suggest how it may be complied with. The purpose of this appendix will be to assist architects, electrical contractors, shop superintendents and electricians who design lighting installations to interpret the code properly.

EXTRACTS FROM WISCONSIN LIGHTING CODE

Order 2112—Artificial Light.

When the natural light is less than twice the minimum permissible intensities of illumination set forth in the following table, artificial light shall be supplied and maintained in accordance with the table. The intensities of recommended practice indicate the desirable illumination for best working conditions.

ILLUMINATION INTENSITY AT THE WORK IN FOOT CANDLES

	Minimum Permissible Intensity	Ordinary Practice
(a) Roadways and yard thoroughfares	0.02	0.05–0.25
(b) Storage spaces	0.25	0.5 –1.0
(c) Stairways, passageways, aisles	0.25	0.75–2.0
(d) Toilets and washrooms	0.5	1.5 –3.0
(e) Rough manufacturing, such as rough machining, rough assembling, rough bench work, foundry floor work	1.25	2.0 –4.0
(f) Rough manufacturing involving closer discrimination of detail	2.0	3.0 –6.0
(g) Fine manufacturing, such as fine lathe work, pattern and tool making, light colored textiles	3.0	4.0 –8.0
(h) Special cases of fine work, such as watchmaking, engraving, drafting, dark-colored textiles	5.0	10.0–15.0
(i) Office work, such as accounting, typewriting, etc	3.0	4.0 –8.0

Note.—The measurements of illumination are to be made at the work with a properly standardized portable photometer.

The minimum foot-candles specify the lowest illumination intensity with which the employees can be expected to work with safety when artificial light is used. It is to the advantage of the employer to provide the intensities of the ordinary practice, as this results in less eye strain, greater accuracy of workmanship, increased production for the same labor cost and less spoilage. When part daylight and part artificial illumination is used, it is desirable to use even higher intensities than those of ordinary practice in the table above. (See note accompanying Order 2111.)

In order that the illumination intensities shall never fall below the minimum during the interval between inspections, installations should be designed to produce initial values at least 25 per cent higher.

Order 2113—Shading of Lamps for Overhead Lighting.

Lamps suspended at elevations above eye level less than one-quarter their distance from any position at which work is performed must be shaded in such a manner that the intensity of the brightest square inch of visible light source shall not exceed 75 cp. (See appendix for method of measuring brightness.)

Exception.—Lamps suspended at greater elevations than 20 ft. above the floor are not subject to this requirement.

Note (a).—Glare from lamps or unduly bright surfaces produces eye strain and increases the accident hazard.

The brightness limit specified in this order is an absolute maximum. Very much lower brightness limits are necessary in many interiors illuminated by overhead lamps, if the illumination is to be satisfactory. In some cases, the maximum brightness should not exceed that of the sky (2 cp. to 3 cp. per square inch).

Note (b).—Where the principal work is done on polished surfaces, such as polished metal, celluloid, varnished wood, etc., it is desirable (but not mandatory at present) to limit the brightness of the lamps in all downward directions to the amount specified in this order.

Order 2114—Shading of Lamps for Local Lighting.

Lamps for local lighting must be shaded in such manner that the intensity of the brightest square inch presented to view from any position at which work is performed shall not exceed 3 cp.

Note.—In the case of lamps used for local lighting, at or near eye level the limits of permissible brightness are much lower than for lamps used for overhead lighting, because the eyes are more sensitive to strong light received from below, and because such light sources are more constantly in the field of view.

Order 2115—Distribution of Light on the Work.

The reflectors or other accessories, mounting height and spacing employed with lamps shall be such as to secure a reasonably uniform distribution of illumination, avoiding objectionable shadows and sharp contrasts of brightness. If local lighting is used, there shall be employed in addition a moderate intensity of overhead lighting.

Exception.—Where the light from the local lamps falls principally upon surfaces which are white or nearly so and the ceiling and walls of the room are light, there is often a sufficient general illumination received indirectly by reflection to obviate the necessity of additional overhead lighting.

Note.—When local lighting is used as the sole source of illumination of an interior, the field of illumination from each lamp is in contrast to the surrounding darkness, thereby causing eye strain and increasing the accident hazard.

Order 2118—Maintenance.

All lighting equipment and windows shall be periodically cleaned, inspected, kept in order, and when defective replaced, so that the intensities of illumination will never fall below those specified in Order 2112.

LAUNDRY CONSTRUCTION AT MAIN CANTONMENTS

Power to Operate the Laundries to Be Supplied by Special Power Houses to Be Erected at the Same Time

The War Department authorizes the statement that laundries are to be provided in all of the principal camps and cantonments. The average cost of each will be $150,000, and $5,754,990 for this purpose has been authorized. The work will be done by the Construction Division.

Power to operate the laundries will be supplied by special power houses which will be erected at the same time. The buildings in each of the larger camps will cost $176,000, while $130,688 is provided for each of the smaller camps.

Instructions have been issued to proceed with the work at the following camps: Johnston, Sevier, MacArthur, Las Casas, Devens, Gordon, Dodge, Grant, Pike, Taylor, Greene, Hancock, Shelby, Sheridan, Beauregard, Wadsworth, McClellan, Meigs and Mills, and Forts Wright and Terry.

Our country is going to live long after this war, and one of the things we will need after the war will be trained young men to take the place of the older who go out. So that I would think it a great mistake for the educational institutions of our country to shorten their courses or in any way cease to provide this trained product, just as I think it a great mistake for our young men to leave these courses before they are trained, excepting those who may be strictly needed.—*Gen. William M. Black, Chief of Engineers, United States Army.*

Pin or Arm Insulation Not Sufficient

Placing Dependence on It on High-Voltage Lines, Especially Where Subjected to Salt Air, May Cause Charring Due to Current Leakage— Some Remedies That Have Been Tried Are Suggested

IN HIGH-VOLTAGE lines all dependence for insulation should be placed on insulators, not on pins, according to a paper read at the recent meeting of the Pacific Coast Section, N. E. L. A., on the "Standardization of Pin-Type Insulators." As pins are designed primarily as mechanical supports, any attempt to utilize them as subsidiary insulators must inevitably weaken their mechanical strength. Wood thimbles on steel pins are especially objectionable whenever they are subjected to appreciable charging or leakage currents, since there results a "digesting" or charring of the wood and failure of the pin to hold the insulator properly. This deterioration is accentuated on pins of this compound type, probably owing to the concentration of the electrostatic stress on the comparatively thin wooden shell of the thimble.

It is evident that in any installation of the higher voltage class (10 kv. and up) in which porcelain insulators of either the pin or suspension type are used the principal insulation is in the insulator, and any subsidiary insulation secured from wood pins or cross-arms must be of minor value. Of course, in arid districts lines will often operate for considerable periods after insulators have been broken and the dry wood of the cross-arm or pole is the only insulation remaining intact. But in districts of ordinary humidity dependence on wood as a subsidiary insulator, particularly where the leakage or charging current must cross sections of restricted area, is not only useless but may be hazardous. Porcelain of good quality will withstand for long periods without deterioration leakage currents and streamers resulting from surface deposits of salt or dust. On the other hand, wood is rapidly deteriorated by such current, and if the wood constitutes a mechanical support at the point of failure, line failure results.

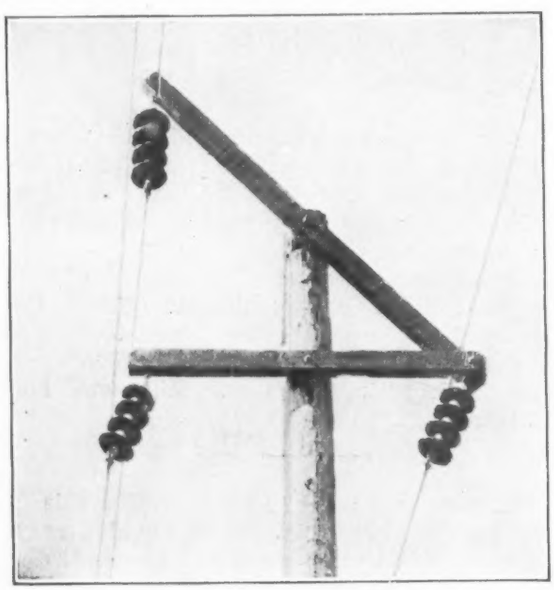


FIG. 1—CHARACTER OF CONSTRUCTION USED ON 70-KV. LINE

Before bonds were installed the wood cross-arms were badly burned, especially at bolts attaching the insulator strings to the arms and at the bolt connecting the arms together.

Failure of wood by burning is, of course, due to the heating of the wood to the point of combustion by the leakage current; that is, by the I^2R loss in the wood. As wood dries out its resistance, R_w increases, and consequently I^2R_w increases, provided that I does not correspondingly decrease. But in any case having to do with a porcelain insulator in series with a wood insulator (pin or cross-arm) the leakage current I is primarily fixed by the greater comparative resistance R_p of the porcelain insulator; thus if $I = E/(R_p + R_w)$ and if R_p is great compared with R_w considerable changes in R_w will have little effect on I. So that as a wood member dries out the I^2R loss in that member increases, for there is an increase in R_w without a corresponding decrease in I. On the other hand, as R_p decreases I greatly increases even though R_w may be on the increase. Thus we may look for charring of wood at times when R_p is on the decrease and R_w is constant or increasing.

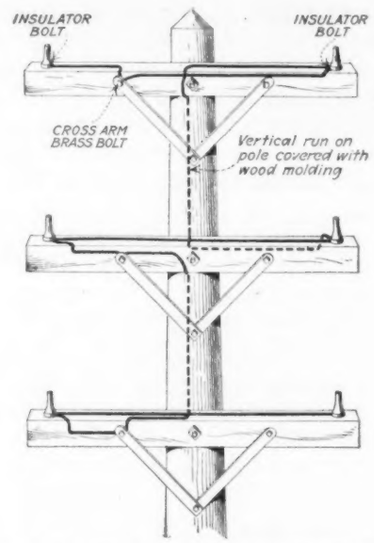


FIG. 2—METHOD OF RUNNING BOND IN ONE PIECE ON TWIN-CIRCUIT, THREE-CROSS-ARM CONSTRUCTION

On the California coast there is a general condition of a rainy and a dry season. Following rains the insulators are clean and consequently R_p is high; I is minimized and the leakage causes no trouble. Even during periods of heavy precipitation when R_p might be assumed to be low on account of the quantity of water on the insulator surfaces I may be comparatively great, but at the same time R_w is low, owing to the water on the wood, and damage does not result. During the dry season which follows the wet dust and salt gather on the insulators, R_p is gradually reduced and I correspondingly increased. Finally there comes a time of cool summer fogs and the deposits of the insulators become relatively conducting, but the wood parts, on the con-

trary, do not accumulate sufficient moisture greatly to reduce R_{ic}. This is the time of burned cross-arms and charred pins.

The only remedies are the use of all-metal pins and the electrical connection of such pins together. The latter expedient is not always necessary on moderate voltage lines, provided that a sufficient degree of over-

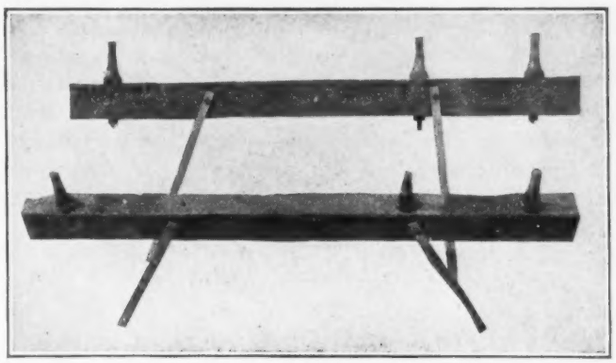


FIG. 3—WOOD CROSS-ARMS IN VARIOUS STAGES OF DEPRECIATION

insulation is used so that the leakage current does not become excessive before the winter rains clean the insulators.

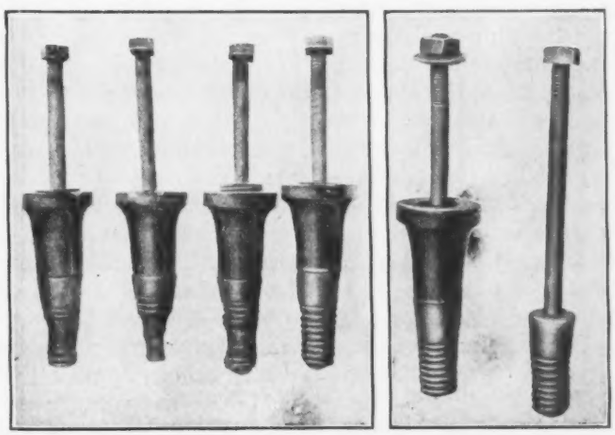
Actual examples of difficulties with wooden members as subsidiary insulators may be of interest. A certain 75-mile (120.7-km.) stretch of 70-kv. three-phase (grounded-neutral) line closely paralleling the coast was first placed in service May 21, 1918. This line is constructed with wood poles and cross-arms. On all but 18 miles (29 km.) of the line ¼-in. (6.35-mm.) steel cables had been installed to connect electrically the pole ends of the suspension insulator strings. The 18 miles of unbonded line represented an earlier type of construction, this being the reason for the omission of the bonds. Although difficulties due to cross-arm burning were foreseen and provided against in the building of the last 57 miles (91.7 km.), it was at first thought that the original 18 miles might successfully operate without bonds. However, on June 3 one insulator string burned loose from an arm, causing the dropping of the line. On June 4 two more arms burned off, the second failure also burning off the entire pole top.

An examination was then made of the 18-mile section where the connecting conductors had been omitted, and it was found that without exception every cross-arm was charred at the point of contact with each bolt supporting an insulator string. Furthermore, charring had proceeded at the point of contact between cross-arms (Fig. 1) and in some cases about the bolts holding the cross-arms to the pole. Thus it will be seen that charring had taken place, particularly where current spread from metal parts into wood, these being the points of maximum concentration. The charred areas radiated from the bolts and to a certain extent the burns followed the wood veins. Following the third failure the unbonded section of line was shut down and connecting conductors were installed, thus obviating further difficulty. It is not known why the trouble took ten days or more to develop, unless during this time the arms were being thoroughly dried out by leakage current. There was no change in climatic conditions during this period, the temperature varying from 54 deg. to 67 deg. Fahr. (12.2 to 19.4 deg. C.).

Connecting bonds as installed on this line consist of ¼-in. (6.35-mm.) extra-galvanized standard steel strand. These are cheaper and probably as effective as copper. The bonds are installed on the top of each arm and are held between pairs of washers where passing around each bolt. Attempts are always made to run the bond in one unbroken piece. Vertical runs along the pole are covered with wood molding. Fig. 2 shows the method of running the bond on a standard twin-circuit vertical construction. The bonds should not only be connected to the bolts holding the insulator strings, but also to those holding the cross-arm braces to avoid burning at these points. On poles having insulators in horizontal strain positions galvanized steel strap is preferable to cable, as it affords a flat bearing surface for the eye bolts or other dead-end members. The bonds described are not grounded except on those poles to which guys are attached.

Under a state law it is necessary to install strain insulators in all guys attached to wood poles. To have installed insulators of the suspension type adequate to the line voltage would have involved an expensive installation and one which was mechanically undependable. On the other hand, to have placed insulators of the ordinary interlocking type in the guys would have given adequate mechanical strength, but these would have been electrically insufficient. Thus line insulator failures would almost certainly have led to the electrical failure of the strain insulator in the guy followed by the burning off of the guy and a most serious mechanical line failure. To avoid these difficulties mechanically strong insulators of the interlocking type were employed in the guys and at the same time the bonding conductors at all guyed poles were grounded, thus short-circuiting the guy insulators.

Cross-arm burning may be serious even on lines of moderate voltage where the insulation is inadequate to



FIGS. 4 AND 5—WOOD PINS IN VARIOUS STAGES OF DEPRECIATION; ALSO LEAD THIMBLES USED TO REPLACE THEM

The wood-thimble pins were removed from a 11-kv. line, where they were used in conjunction with insulators rated at 27 kv. The lead thimbles are made in plaster of paris molds.

the physical conditions imposed. Fig. 3 shows cross-arms removed from an 11-kv. line after seven years of service. The top and sides of the arm are seen to be seriously charred. The pins also have suffered, the 1-in. (2.54-cm.) thimbles being badly digested. The insulators in this case were two-piece porcelain of fairly modern design rated by the manufacturers at 15 kv.

They were quite evidently inadequate to the service imposed.

Wood-thimble pins often suffer charring without any evidence of cross-arm burning. Fig. 4 shows a group of pins with 1⅜-in. (3.49-cm.) thimbles and ⅝-in. (15.8-mm.) bolts in various stages of deterioration. The pins were removed from an 11-kv. line in the fog district but outside of the spray belt. The insulators were rated by the manufacturers at 27 kv., and the pins when removed had been in service five years. The cross-arms were unaffected in this case. In fact, there are many lines utilizing wood-thimble pins which suffer severe depreciation of thimbles yet in which cross-arms are unburned. This would tend to indicate an especially concentrated stress on the thimbles. It is also possible that during the first seasonal rains, when cross-arms are protected from excessive I^2R losses by moisture on surface, the pin being shielded would be subject to particularly heavy leakage. Pins in dry districts are virtually unaffected.

All-steel pins on the lines from which the pins shown in Fig. 4 were removed give good results with insulators of the same type, there being no burning of cross-arms. It has been quite evident from the experiences of this company that wood-thimble pins are unsuited to its lines, and they have been superseded in new work by all-metal pins with slotted thimbles and felt insertion. There have been no difficulties due to cracked insulators with these pins; the expansion troubles which are usually feared with all-metal pins have not materialized.

Pins of the wood-thimble type with porcelain bases are reused, if in good condition, but the wood thimbles are split off and replaced with lead thimbles made up in plaster of paris molds (Fig. 5). These give good service, although the porcelain base weakens the unit as compared with an all-metal pin.

Lines along the Pacific Coast are not only subjected to severe stresses, owing to spring and summer fogs, but if within a mile or more from the shore, especially if the cliffs are not high, they are subjected to spray. For long periods the steady trade winds sweep in from the west, and the spray from the breakers on the beach is carried inland as a fine mist, often for a distance exceeding 2 miles (3.2 km.). On clear days this can be plainly seen as a white streak about 100 ft. (30.5 m.) high with a quite definite outline. This spray makes the insulation of lines close to the coast particularly difficult and accentuates any troubles arising from the use of wood as a subsidiary insulator.

Although most of the charring of pins and cross-arms probably takes place during the summer, actual line failures are likely to occur during the first winter rainstorms. In some cases the pin threads cease to hold the insulators and they are blown entirely off the pin. At other times the first rains are light in character, and before the summer dust and salt deposits are washed off flashovers occur which start pole fires despite the reduction in the cross-arm resistance.

Lines built with all-wood pins do not seem to be so susceptible to pin destruction as those built with combination pins of the wood-thimble type. However, if the leakage is considerable the destruction of the pin will proceed. The threads especially are affected, and even if there is no blackening or other evidence of charring, the threads gradually disintegrate.

ECONOMIZING OF FUEL DISCUSSED BY A. S. M. E.

E. L. Cole of the Fuel Administration Cites Instances in Which Inferior Fuel Was Turned Back to Mine Operators

An extended discussion of modern boiler-plant practice was a feature of the late convention of the American Society of Mechanical Engineers at Worcester, Mass.

E. L. Cole, secretary conservation division federal Fuel Administration of Pennsylvania, cited instances in which inferior fuel shipments have been turned back to the mine operators and emphasized the determination of the administration to enforce the stated standards. During January more than half the coal delivered contained 40 to 55 per cent of slate.

"The administration formulated a standard of impurities that should not be exceeded," said Mr. Cole. "The operators thought it was a joke, and not until inspectors were appointed did they realize that the government would not permit delivery of inferior fuel. Coal that was delivered in Philadelphia was sent back to the mines. Seven cars were hauled to the dumping ground; three cars in one day were given to a church, eighteen cars to a hospital, and the operators were compelled to pay the freight, demurrage charges and cartage bills. In addition, the name of every operator was published; the name of the jobber was published, as was the point to which the coal was delivered or diverted, and the anthracite and bituminous operators, realizing that this was going to limit their profiteering, actually had the audacity to go to Washington to try to cripple our effectiveness. Of course they failed."

Mr. Cole said that quite early in the year one of the largest anthracite producers in Pennsylvania had had the effrontery to ask the Fuel Administration to increase the amount of impurities permitted in anthracite coal to the extent of 2 per cent. This would be equivalent to dumping on the market 1,600,000 tons of slate and dirt at an additional profit of $6,000,000 to the operators.

"You can readily see," said the speaker, "why we need more data, so that when these men approach us, as we expect them to, we shall have data compiled and submitted by this society to the administration and can chase them back to the mines and tell them: 'Clean your coal and deliver it, and make your usual profit.'

"Any suggestion for the delivery of coal in the market containing more impurities than at present allowed should be accompanied, if it is an honest suggestion, by an offer to reduce the price of coal in the market in exact ratio to the decreased fuel value. On behalf of William Potter, the Federal Fuel Administrator of Pennsylvania, we say he pledges himself and his administration to aid any measure undertaken by this society or any other organization to provide consumers, industrial and domestic, with reasonably clean coal as a permanent institution in the United States. The consumer of coal who accepts coal which is inferior has himself to blame for the inferior results from using it, because the government has fixed the price and standardized both bituminous coal and anthracite coal."

What the Commissions Are Doing on Rates

Final Presentation in Series of Reports from State Commissions Showing the General Attitude of These Bodies on the Problems Created by Higher Operating Costs of Electric Utilities

The following article concludes the series dealing with the course of the public service commissions in the different states in the matter of electric service rates. The other articles of the series appeared on June 8, June 29 and July 27.

REGULATION, like all other issues to-day, is properly subordinated in principle and in detail to the national aim in the war. The national purpose calls, in the words of President Wilson, for "maximum efficiency" of the utilities. It calls, in effect, for the exercise of such authority by the directly regulatory bodies as will not only permit but promote that maximum efficiency.

To maintain this state of efficiency is now the first duty of the utility officials. If the resources within their control do not enable them to do this, their next course is to lay the fact frankly and completely before the governing commissions. If then the state commissions neglect or refuse to act as the facts justify, there can be little doubt what the eventual outcome will be. It will be the substitution of national control for state control.

Reports from various state commissions follow:

VIEWPOINT OF THE ILLINOIS COMMISSION

The Illinois Public Utilities Commission has not in general authorized increased rates solely on a basis of the increased costs of operation. The commission has felt that, in addition to this, it should have some idea of the value of the property, an analysis of the operating expenses, methods of operation, the amount of revenue which will be realized under the increase and other pertinent information. It has not insisted upon a complete and full detailed valuation of the property but has considered such evidence as the utility might have available without the making of a detailed valuation and has also considered the report of the engineering department based upon a hurried valuation of the property. Such reports of the engineering department have usually indicated that a minimum value of the property was at least a certain amount, with the statement that a detailed appraisal might show results in excess of this figure. Such a showing as to valuation has been regarded as sufficient for the present emergency conditions.

While the commission has insisted upon a showing of the above character before rates are authorized to become permanently effective, in cases where a financial emergency has appeared to exist the commission has authorized temporary rates upon a showing by the company of the need for immediate relief. These authorizations for temporary rates have been given pending further investigation by the commission as to the justice of the increases that are asked for, and they have carried with them a provision that the company should refund the differences between the rates thus temporarily authorized and any rates which the commission might later determine as being just and reasonable to meet the particular situation. These temporary authorizations have been granted in a number of cases in which the utilities represented that their situation demanded immediate relief and presented evidence to the commission in support of this contention. In granting such temporary authority, the commission has felt that it was acting in accordance with the expressed wishes of the United States government that public utility service be protected during the present emergency, and that it has acted in a way to conserve the interests of the consumers of electric service.

It is the opinion that increases have been asked in about 60 per cent of the communities of the state which are receiving electric service. This by no means involves 60 per cent of the companies operating in the state since so many of the companies serve a large number of communities. It is doubtful if the number of companies which have asked for increases would amount to 30 per cent.

It is felt by the commission that the present situation is one of emergency and that it would appear that conditions will be greatly relieved upon the cessation of the war. However, it does not believe that conditions will revert immediately to their former status. It is anticipated that during the next few years readjustments will have to be made in electric rates rather frequently. There are several cases in which electric utilities which have secured one increase of rates have requested authority for a second increase. The commission, in all of these cases, is retaining jurisdiction for the purpose of making such adjustment either to increase or decrease as may appear to be justified by current conditions.

Approximately seventy applications for electric rate increases were made to the Public Utilities Commission of Illinois in 1917. Most of these were technical increases, but in reality did not amount to much. Probably twenty-five involved material increases. In 1918 up to June 1 the commission had received about eighty applications, and of these fifty were for material increases. The commission has had pending applications covering rates for over 200 communities. In the great majority of the cases the commission has found that some relief should be granted, although not always to the extent covered by the application.

DEVELOPMENT ANTICIPATED IN ARIZONA

Ben Ferguson, engineer Arizona Corporation Commission, writes:

"To date two companies have made application for revision of rates, namely, the Tucson Electric Light & Power Company and the Douglas Traction & Light Company. Several other applications will, no doubt, be received soon.

"From the studies made in this office, we think that electricity utility rates will likely return to the old figures when normal conditions return, for the reason that the most important factor in operation is the

cost of fuel oil, which it is fair to expect will eventually be considerably less than the present figure, and for the further reason that the material resources of Arizona are being developed rapidly, causing profitable new outlets for power."

[The applications made by the companies mentioned were presented in accord with an order of the commission, issued on application of the Arizona Gas, Electric Light & Power Association. This association, on behalf of its members, presented by petition the situation produced by higher operating expenses and requested an order authorizing "such companies as can show deficiencies in current revenues to amend their present rate schedules by the addition" of a surcharge. The commission in its order set forth the higher cost conditions, particularly in oil, and the desirability in the public interest that the properties be maintained and continue to render the best service possible under the circumstances. Although, before authorizing a surcharge, the commission asked sufficient data to assure it and any one else interested that such a surcharge is fully justified by the operations of the individual company, it said: "There will be some unavoidable impairment of these facilities due to difficulties in securing money for maintenance, but we believe that any concern facing an actual deficit should be permitted to increase its rates without unnecessary formalities and prolonged proceedings."—EDS.]

"UP-STATE" NEW YORK COMMISSION'S ATTITUDE

Secretary Francis X. Disney of the New York Public Service Commission, Second District, says to the ELECTRICAL WORLD:

"It is quite impossible for the commission to give categorical answers to your inquiry. It should be explained, first, that under the general law applicable to this district both gas and electric companies may increase their rates upon filing thirty days' notice of their intention to do so and without the approval of this commission. Rate cases therefore usually come before the commission upon complaint of the consumers, and while an increase of rates is quite likely to bring a complaint, it does not necessarily do so. The commission has not been required so far to pass upon many increased electric rates, and can only say that its intention is to make as careful an inquiry as possible in each instance and render the decision which seems to be just and reasonable, all factors considered."

[A number of increases have been made in the "up-state" district without appeal to the commission. In a case decided recently it was held that in the existing circumstances the commission should be mindful of the admonition of the President of the United States, based upon the action of the Comptroller of the Currency and the Secretary of the Treasury, to respond promptly to the necessities of the situation as regards the needs of public utilities; that it should also bear in mind the attitude of the War Finance Corporation in respect of supplying means for new capital expenditures, and while it should not fix rates unnecessarily high, it should not pursue a policy of starvation with the possible effect of depriving the public of its utilities. The commission expressed the belief, however, that the public service corporations must and do expect to submit to their share of the common sacrifice, and that neither the appeal of President Wilson nor the ruling of the War Finance Corporation had in view the maintenance in all cases of normal profits.—EDS.]

MONTANA COMMISSION RECOGNIZES INCREASED COST

Charles P. Cotter, secretary of the Railroad and Public Service Commission of Montana, writing to the ELECTRICAL WORLD, says:

"This commission is authorizing electric utilities to increase rates on a proper showing of increased cost of operation. The increase applies to all classes of consumers, unless discrimination exists, when it may apply to a special class of customers.

"Since Jan. 1 applications have been received for increases from two electric utilities. The commission has initiated hearings in five additional cases. One increase of approximately 10 per cent was granted; in the other case the rates were equalized without materially affecting the income. The remainder of the cases are pending at this time. We estimate that about 5 per cent of the utilities have requested increases. At this time it is impossible to state whether the conditions of the utilities will be altered permanently, or if the situation is merely a temporary war emergency."

PRACTICE IN COLORADO

George A. Flannigan, secretary Public Utilities Commission of Colorado, says to the ELECTRICAL WORLD:

"If there is an electric utility in the state that has not had an increase in operating expenses, the commission would be very glad to know about it. The rule in this regard is no different from what it has always been. If the increase in earnings has been sufficient to offset such increases in operating expenses or if the net earnings of the utility are sufficient to provide for a fair return to the owners of the property, no increase in rates would be authorized on a showing of increased operating costs.

"The practice in this regard [application of increases to different classes of consumers—EDS.] must necessarily vary. In some cases certain classes of service are served on a very low margin—so much so that with an increase in operating expenses such service is given at a loss. Obviously, the rates for the various classes of service must be so fixed that the consumers in these classes will bear their portion of the burden. In general an attempt is made to place the burden on the consumers who should bear it.

"There are only a few cases in which the commission has authorized increases in the rates of electric utilities after hearing. On the other hand, the law in this state is such that public utilities may make increases in their rates by filing such rates with the commission for a period of thirty days before their effective date. If objections to such rates are not made or if not suspended by the commission, they automatically become effective thirty days after filing. A number of the electric utilities have made rate increases in this manner. There are at this time five applications for rate increases pending upon which the commission has taken no action.

"The number of electric utilities at this time seeking higher rates is very small in comparison with the number operating in the state."

STATION & OPERATING PRACTICE

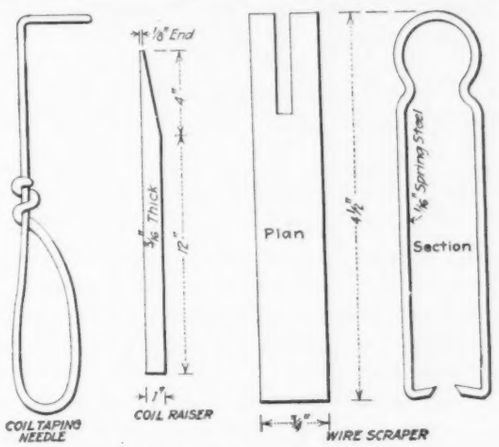
A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

HOME-MADE TOOLS AID IN ARMATURE COIL WINDING

Wire Scraper, Coil-Taping Needle and Coil Raiser Are Easily Made and Convenient for Use in Electrical Repair Shops

BY MAURICE M. CLEMENT

Oftentimes when considerable coil winding must be done certain minor tools are needed which cannot be purchased ready-made. These tools, however, are usually small and can be constructed in the shops. The coil-taping needle illustrated herewith consists merely



TOOLS ALL MADE FROM COMMON STOCK

of 1 ft. (30 cm.) of No. 14 banding wire shaped so that it can be used for taping coils in closed-slot stators. After the user is accustomed to this device high speed may be attained.

The coil raiser consists of a piece of steel, 16 in. by 1 by $\frac{3}{16}$ in. (40.6 cm. by 2.5 cm. by 0.5 cm.) with a 4-in. (10-cm.) one-sided taper on one end for stripping open-slot armatures and stators. This also can be used to good advantage in removing grounded coils from a newly wound armature or in raising coils sufficiently to allow for insulating weak spots in the coils, the main object in this case being to lift out a tight-fitting coil without damaging the insulation.

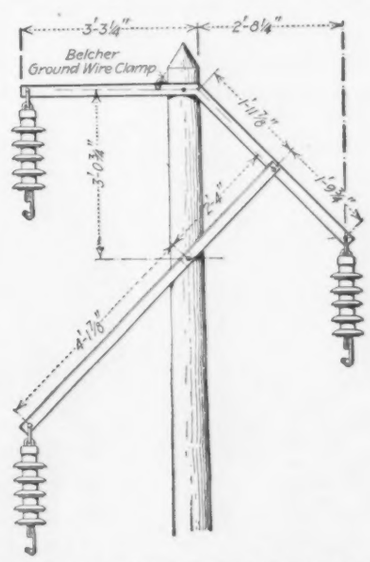
The wire scraper is very simply made and very economical, because it eliminates the use of a knife, whose life is short on account of the rough treatment accorded it. This device is made of spring metal, 12 in. by $\frac{3}{4}$ in. by $\frac{1}{16}$ in. (30 cm. by 1.9 cm. by 0.2 cm.). The knife edges can be sharpened by means of a file and the tool used indefinitely. A section the shape of a rectangle is cut from the metal at the handle end, greatly increasing the spring effect of the device.

For driving fiber wedges between the top of coil and the lamination overhang in closed-slot machines a wedge drift, made of a piece of tool steel, 8 in. by 5 in. by $\frac{3}{32}$ in. (20.3 cm. by 12.7 cm. by 0.23 cm.), over which is fitted a loose-fitting steel sleeve, $\frac{1}{16}$ in. (0.16 cm.) thick, is very convenient. This is used by inserting the fiber wedge about $\frac{1}{4}$ in. (0.6 cm.) into the slot; then, with the drift pulled back into the sleeve, the sleeve is fitted over the wedge, which is driven into the proper place, the sleeve holding the wedge in position.

SIMPLE STEEL CROSS-ARM OF EASY CONSTRUCTION

Arm Is Light and Affords Wide Clearance—Held to Be Superior to Wishbone Construction for Some Purposes

A simplified modification of the wishbone cross-arm worked out by the engineering staff of H. M. Byllesby & Company for use on Southwestern properties is held to have advantages over other styles. Its construction is very simple. It consists of two pieces of 2.5-in. by 2.5-in. by $\frac{5}{16}$-in. (6.35-cm. by 6.35-cm. by 0.78-cm.) angle iron held together by a single bolt. The upper piece contains only one bend and the lower member is straight. The pieces, which together weigh 65 lb. (29.5 kg.), are held together by a $\frac{5}{8}$-in. (1.59-cm.) bolt 1.5 in. (3.8 cm.) long. The arm is bored for two $\frac{5}{8}$-in. (1.59-cm.) through bolts, for three 0.75-in. (1.9-cm.) insulator "C-hooks" and for a $\frac{9}{16}$-in. (1.42-cm.) Belcher ground



CROSS-ARM MADE OF ANGLE IRON WITH ONLY ONE BEND

wire clamp. The arm shown is made for 66,000 volts. It has been used by the Oklahoma Gas & Electric Company, and in this lightly loaded district it has given general satisfaction. It is light in weight, is easy to manufacture and assemble, on account of having so few bends, and affords ample clearances.

REDUCING THE COST OF INDUSTRIAL SWITCHBOARDS

Plan Developed on Pacific Coast Entirely Does Away with Marble Panels and Copper Busbars—Resulting Board Is Flexible

A new development in switchboards for industrial plants, conceived by Louis F. Leurey of San Francisco, is being adopted by many concerns doing industrial plant wiring on the Pacific Coast. By eliminating

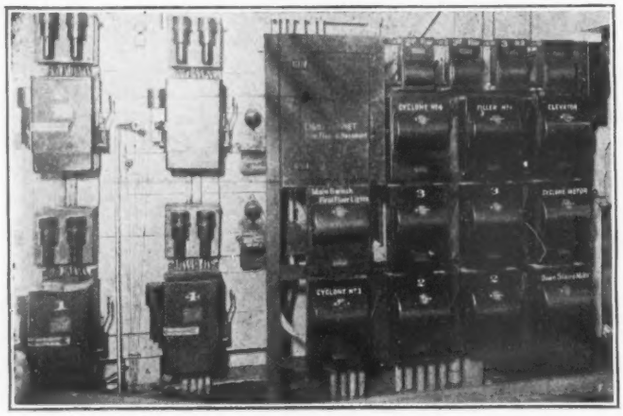
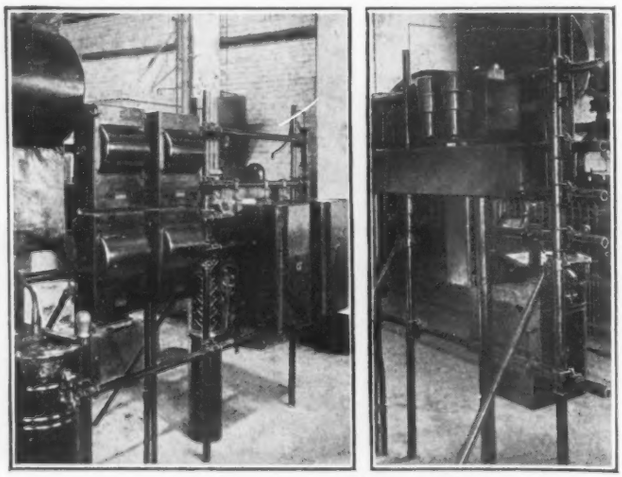


FIG. 1—SWITCHBOARD IN ICE FACTORY HAS NO COPPER BUSBARS OR MARBLE OR SLATE PANELS

the use of copper busbars and marble panels and substituting instead insulated wire leads properly housed and iron pipe or angle-iron framework carrying inclosed switches, these companies are building boards at low cost. It is reported, moreover, that the boards thus built are operating just as satisfactorily as any of the older types. If it is desired to make the job appear more complete, steel-boxed panels made of ordinary sheet steel can be used, but these boards are still inexpensive. Eliminating the necessity for busbars effects a still further reduction in cost. The mains are



FIGS. 2 AND 3—REAR OF BOARD SHOWING SHEET-IRON TROUGH FOR LEADS TO SWITCHES AND DETAILS OF IRON-PIPE CONSTRUCTION; STEEL-BOXED PANELS OF ORDINARY SHEET IRON MAKE NEAT JOB

brought to the switchboard in conduit or can be run either across the front or the back of the board in galvanized-steel troughs made by any tinsmith. This box has flanged sides to which a removable cover is screwed. Taps to each switch are made through ordinary types of connectors. This construction is said not only to be less expensive in first cost but also to permit extensions and changes at costs less than those incident to changes on boards using bar copper.

One particular advantage of these boards is that they may be made up on short notice because all of the necessary material can easily be secured locally and very little machine work is necessary. On marble and slate panels made to specifications in the factory delays are likely to occur. Another advantage is that these boards need to be made to conform only to the requirements of space available and equipment to be mounted. Panelboards, on the other hand, must be laid out according to certain prescribed standard panel dimensions. This advantage of flexibility is considered especially important where electrical apparatus is to be installed in a structure already built. It is expected that these boards will grow in favor of the necessity of conserving copper and eliminating unnecessary transportation of such heavy products as slate becomes more urgent.

AMICABLE STANDARDIZATION OF JOINT-POLE PRACTICES

Committee Made Up of Utilities Concerned Draws Up Rules That Prove Satisfactory to All Companies of Connecticut —Adopted by Commission

So much difficulty is entailed in pleasing everybody when central stations, telephone and telegraph companies wish to use the same poles for light, power and communication lines that it is usually decided to build separate lines regardless of the high cost. Now that materials are hard to get and public utilities are paring costs whenever possible, many companies are making extreme efforts to come to some decision whereby every one interested shall receive proper consideration. In Connecticut the Public Utilities Commission arranged for a committee to be appointed that consisted of three members of the light and power interests and three representatives of the communication companies. The chief engineer of the commission was made a member ex officio of the committee.

At an informal hearing called by the commission the rules formulated by the committee were discussed, and after the specifications were revised slightly by the utilities they were accepted by the commission and adopted. In order to simplify the rules as much as possible each class of conductor and attachment was considered under its own individual heading, thereby eliminating the necessity of making cross references.

One important point was gained for the lighting interests when the telephone companies agreed to the joint use of poles carrying a constant-current, series, metallic circuit of not more than 10,000 volts because the previous limit as outlined in the N. E. L. A. rule was 7500 volts. The current, however, is not to exceed 7.5 amp. In order to operate more safely it was decided that the vertical distance between primary or series circuits and communication conductors should be 72 in. (183 cm.), instead of 40 in. (101 cm.). The vertical spacing of secondaries and communication conductors is 48 in. (122 cm.), instead of 40 in. (101 cm.), as permitted by the N. E. L. A. rules.

Although the rules were not intended to serve as specifications for materials or even complete specifications for construction methods, they do attempt to define precise relative locations of the various power, communication and lighting conductors and attachments. It is believed that the classification and systematic typographical arrangement will go far toward facilitating an extensive improvement in all new joint-use construction where hitherto the conflicting interests frequently have been responsible for conditions hazardous to their own employees, the employees of others, pedestrians and even to consumers.

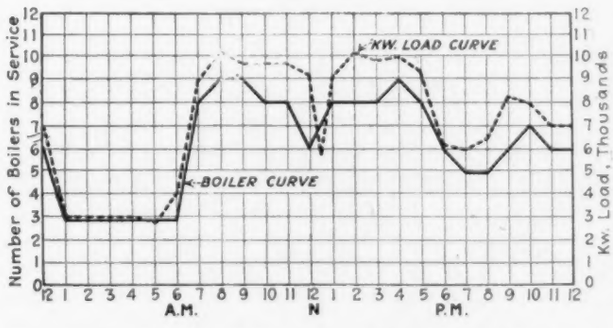
One point of considerable interest is the fact that the specifications do not provide for carrying communication conductors and conductors for trolleys of over 700 volts on the same pole. This has left the question in such a way that each case may be decided by mutual agreement as to the particular conditions under which trolley conductors may be operated on the same pole with communication conductors, with the understanding that the agreement will have to be ratified or approved by the Public Utilities Commission.

These rules are intended to amplify, systematize and hence supplant those on pages 133-163 of the 1911 report of the committee on overhead-line construction of the N. E. L. A., the latter rules having hitherto been recognized by this commission. The Western Union and Postal Telegraph Companies were directly represented, and the action of the Southern New England Telephone Company may be construed as expressing the agreement of the American Telephone & Telegraph Company to these formulated rules.

HOW TO AVOID EXTRAVAGANT UTILIZATION OF BOILERS

Record-Keeping System Which Tells Instantly Whether Too Many Boilers Are Kept Under Full Head of Steam as Load Varies

Curves plotted to show the results of operation in both the turbine room and the boiler room are used by the engineers and managers of an Indiana plant as a check against extravagant operation of boilers. The curve



BOILER CURVE SHOULD NEARLY COINCIDE WITH KW. LOAD

chart is arranged so that the number of boilers in service and the load on the plant in kilowatts are plotted against time. By using the same abscissas for both curves and by choosing a proper ordinate scale the curves fall very near together if proper operation is obtained. Any variation from normal operation is at once noticeable, owing to the wide divergence which the lines show. When this occurs the manager generally demands an explanation from the chief of the boiler room. There must always be a good reason for carrying more boilers than the chart indicates are necessary.

Data from which these curves are plotted are collected separately by the man in charge of the boiler room and the man in charge of the engine room. The relation of the two curves to each other is therefore known to the boiler-room chief only after he has turned in his data. This precludes any possibility of getting "doctored" figures into the report. To assist the boiler-room chief in holding just the right number of boilers on the line, or in readiness to go on, it was of course necessary to place in the boiler room a totalizing wattmeter to indicate the station load.

TABULATING TROUBLES ON TRANSMISSION LINE

Line Data Filed to Give Permanent Information on Performance of Equipment—Can Be Used to Forestall Trouble

When trouble occurs on the transmission system of the Public Service Company of Northern Illinois a complete record is made of the incident by filling out a blank form like the one reproduced. The questions asked are those pertinent to this company's system, but a similar chart can be compiled especially applicable to any system on which it is to be used. Under "Remarks" are draw-

DATA ON TRANSMISSION LINE TROUBLE

191..

Weather conditions
Location of trouble
How located
Nature of trouble
Repairs made by

3 4 5 7 8 11 13 58 64

Station on system
Generator capacity in service
Load on station
Load on transmission line (indicate on diagram)
Miles of transmission line connected to system or section
System sectionalized at Joliet, Streator, Blue Island
Was INU Co carried on our system ..... If so, how much

Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch on ..... opened* ..... at ..... M. Relays set at ..... kva ..... sec.
Switch should have opened ..... Relay set at ..... kva ..... sec.
Switch should have opened ..... Relay set at ..... kva ..... sec.

What effect noted at stations 3 4 5 7 8 11 13 58 64

Was voltage lowered
Duration of same
Was frequency lowered
Duration of same
Did lightning arrester operate
(Give phases and line number)
Ground detector indicated
Type of line construction
Location of defective insulator
Were pins grounded on pole?
What phase was trouble on?
Was there ground wire on pole?

REMARKS:

* Note whether automatically or by hand.

ings of two standard transmission pole tops. If an insulator or bracket arm is defective, it can be designated by an arrow. This record can be filed under headings indicating apparent effects, so that if an accident occurs the chart may be looked up and the cause immediately found.

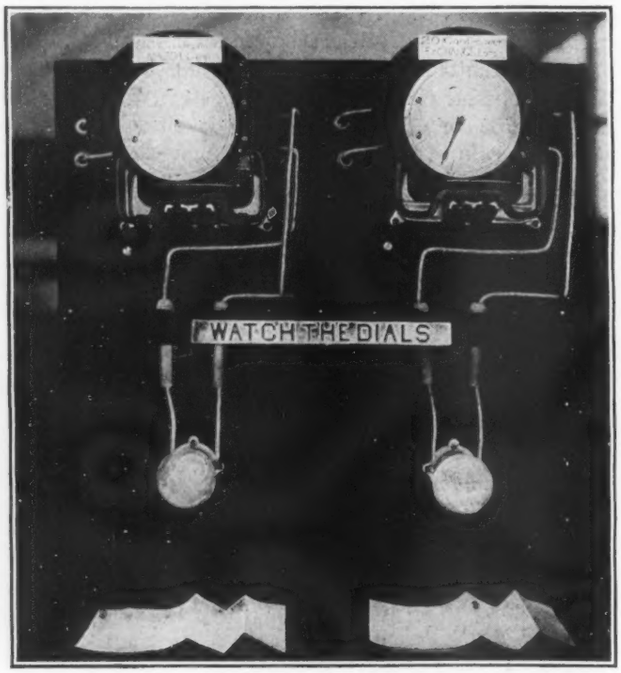
CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

REDUCTION OF LAMP RENEWALS RESULTS FROM DIRECT DRIVE

Educational Campaign, Coupled with Popular Interest in Coal Conservation, Enables Houston Company to Save Over $6,000 Annually

The Houston (Tex.) Lighting & Power Company last fall inaugurated a campaign of education for the purpose of reducing the annual burden of lamp renewal expense and has been so successful that already a very large saving has been effected. Of course the Houston public has read as much about the "mazda" lamp as the people of any other city, but the company had been granting free renewals on "gem" lamps and a large



AN EDUCATIVE DISPLAY USED IN HOUSTON, TEX., IN CAMPAIGN TO REDUCE LAMP RENEWALS

number of consumers had continued to burn these lamps.

The great popular interest in coal conservation and other war-time savings, however, suggested the possibility of a special campaign for "mazda" lamps that would call attention to the wastefulness of the less efficient incandescent lamps and secure the general adoption of "mazda" lamps.

H. O. Clarke, commercial manager, in commenting on the campaign, says:

The policy of free lamp renewals carried out by a great number of large central stations is to-day merely the inheritance of a mistaken and misguided policy of the past, and in the central-station game a precedent once set and established becomes a rule which it is hard to change, especially so in the furnishing of free renewals. A great many people believe that the abolishment of a practice which gives them something free is simply an effort on the part of the central station to make for itself additional money and to take from the customer a service to which he is entitled. Selling the idea to the public of the advantage of purchasing a high-grade lamp rather than accepting free an inferior lamp is really the basis of a campaign to reduce lamp renewals. To aid us in driving home the thought we have hit upon the plan here in Houston of using a counter display rack, which consists of two compartments, in one of which is placed a "mazda" lamp and in the other a free-renewal lamp or exchange lamp. The two compartments are connected separately, each to a meter, and the meter dials are calibrated to read in dollars and cents.

When a customer comes into our office the first thing we do is to take him to this display box and show exactly why we can afford to give away an exchange lamp. At the same time we show him a comparison of the color values of the lamps, and we follow this with war-time arguments, appealing to the patriotism of the customer on the basis of fuel conservation. The dials assist us in showing that the fuel consumption necessary to serve the "gem" lamp is twice that required to serve an equivalent candlepower of "mazda" lamp.

The work has been very effective, and we expect that we shall be able to reduce our free lamp renewals to the value of $400 for the entire year. We do not expect to have to furnish a single free lamp in 1919. When one stops to consider that in the short period of time since "mazda" lamps came in we have been able to reduce our free lamp renewals from $7,000 to $400 per year—and in 1919 we hope to reduce them to nothing per year—it will be agreed that our educational work along this line has been most effective. Last year our total cost was $1,646.40.

We have not done any advertising in this campaign, nor have we announced any policy of abolishment of free lamp renewals, and our results are attributed solely to untiring personal efforts in educating and appealing to the patriotic sense of the consumer.

ELECTRIC COOKING LOAD OF SMALL CALIFORNIA CITY

In Less Than Twelve Months an Additional Load of Nearly 1000 Kw. Has Been Added to Central Station Company's Lines

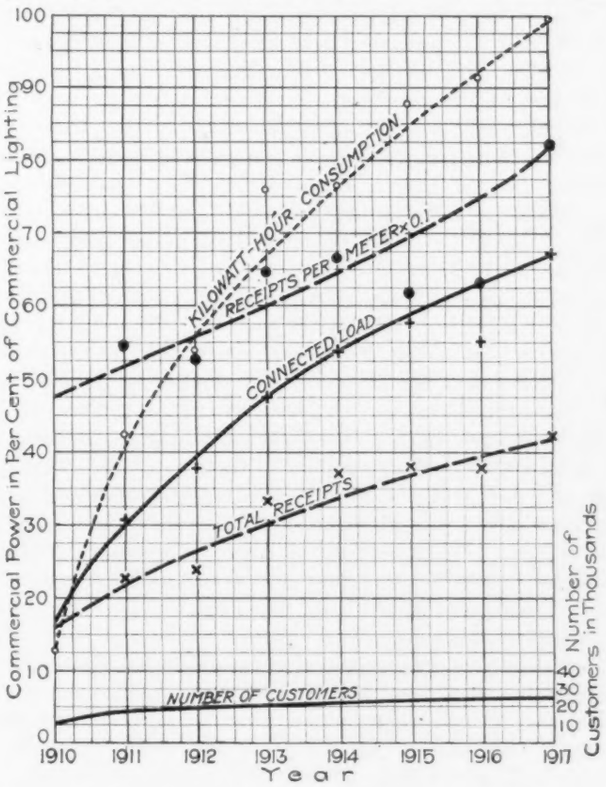
Since the beginning of the electric cooking and heating campaign of the Stockton (Cal.) division of the Western States Gas & Electric Company a little more than a year ago, nearly 1000 kw. of this class of business has been added to the company's lines. The following table shows the number of ranges and heaters sold and their total capacities:

	Total Capacity, Kw
101 ranges	668.160
89 water heaters	174.700
84 air heaters	151.467
1 plate	0.880
Total	995.207

RELATION BETWEEN COMMERCIAL POWER AND LIGHTING BUSINESS

Analysis of Relative Income, Connected Load and Energy Consumption of Two Classes of Service in Farming Region

The accompanying curves illustrate the relative growth of commercial power compared with commercial lighting business as deduced from the statistics of a Western central station. It is interesting to note the rapidly increasing importance of the power business which has been characteristic of central-station operation during the past few years. Although the lighting department has sustained a consistent and creditable growth, the number of customers having nearly quadrupled in eight years, the power business had



RELATIVE GROWTH OF COMMERCIAL POWER AND COMMERCIAL LIGHTING BUSINESS IN WESTERN CENTRAL STATION

progressed at a far more rapid rate, and this despite the fact that the community served is not a manufacturing center.

The company from the records of which these figures were taken has approximately 22,500 customers in all. An energetic new-business department began operations in 1909, and the results of its labors were apparent almost immediately. Although the lighting department was by no means neglected, naturally the power business was given more attention. In 1910 the customers using power numbered only 2.6 per cent as many as those for lighting. During the next few years competitive forms of motive power were gradually eliminated until in 1915 the number of power customers reached apparent saturation at 6.2 per cent of the number of the lighting cusotmers, which figure has remained practically constant since. The total receipts increased steadily from 15.9 per cent in 1910 to 42.5 per cent of the lighting receipts in 1917. The kilowatt-hour energy consumption of power customers has increased from 12.2 per cent in 1910 to practically 100 per cent, or equal to the lighting consumption, in 1917.

The steeper slope of the kilowatt-hour curve as compared with the curve of total receipts is, of course, due to a higher percentage reduction in the power rates than in the lighting rates, although it might be noted that both rate schedules were reduced several times during this period. The ratio of connected power load to connected lighting load has advanced steadily from 16.3 per cent in 1910 to 67.4 per cent in 1917.

An interesting comparison is that shown by the curve of relative receipts per meter. In 1910 the receipts per power meter were 4.71 times as great as the receipts per lighting meter; in 1917 they were 8.23 times as great. The receipts per lighting meter have been fairly constant during the period, reductions due to rate decreases having been very soon made up in all cases by increased consumption. But the receipts per power meter have gained steadily in spite of greater per cent reductions in rates than the lighting reductions. This has been due to the acquisition of larger customers and better load factors.

As might be expected, the points for numbers of customers and connected load fall close to smooth curves, as these are largely unaffected by rate changes and general business conditions. The curve of kilowatt-hour consumptions is to a large extent independent of rates but is influenced by any condition which causes a change in the one class of service without a corresponding change in the other, as, for instance, weather conditions in agricultural districts, which greatly affect the irrigation consumption but are without influence on the lighting. The curves of ratios of total receipts and receipts per meter, being affected not only by such conditions but also by rate changes, are naturally susceptible to considerable variations.

In deducing these curves only commercial lighting and power have been considered. Municipal lighting and railway power are not included.

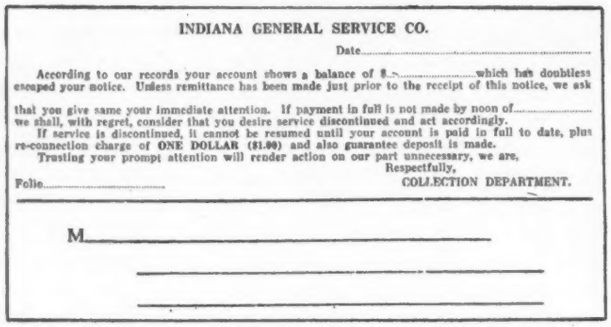
METHOD USED TO DECREASE DELINQUENT ACCOUNTS

Notice That Declares Central-Station Customers Will Be Subjected to Reconnection Charge Produces Desired Effect

Among the plans which are being developed to assist in hastening customers' collections, those which are based on the reconnection charge idea are said to be most effective. The accompanying form shows how this idea is applied by the Indiana General Service Company of Muncie. With this company all bills are due on the tenth of the month. After the tenth all delinquent accounts are taken off the books and notices like that in the illustration are sent to those in arrears. It is the company's policy to give the customer five days from the date of sending these notices to pay his bill. Service is then disconnected without further notice. After negotiations have reached this stage it is necessary for the delinquent customer to come to the office, settle his bill in full, pay $1 for reconnection and make

a deposit to insure payment if he has not already established credit with the company.

Notices of this type were used by the Indiana General Service Company for the first time in July, 1918. As



INDIANA GENERAL SERVICE CO.

Date.....

According to our records your account shows a balance of $.....which has doubtless escaped your notice. Unless remittance has been made just prior to the receipt of this notice, we ask that you give same your immediate attention. If payment in full is not made by noon of..... we shall, with regret, consider that you desire service discontinued and act accordingly.

If service is discontinued, it cannot be resumed until your account is paid in full to date, plus re-connection charge of ONE DOLLAR ($1.00) and also guarantee deposit is made.

Trusting your prompt attention will render action on our part unnecessary, we are,

Respectfully,

Folio..... COLLECTION DEPARTMENT.

M.....

TYPE OF DELINQUENT NOTICE THAT GETS RESULTS

a result Thomas F. English, general manager of the company, stated that a very material reduction was noticed in the number of delinquent accounts.

METHODS OF FINANCING EXTENSIONS OF LINES

Resume of Plans Which Are Being Tried Out to Provide Service to Essential Lighting and Power Installations

Before a recent meeting of the commercial men of the Indiana Electric Light Association, R. Thurman of Muncie presented a comprehensive digest of plans used by various utility companies in the Central West for financing extensions under the present conditions.

Owing to the high cost of materials and labor and to the fact that utilities probably will not be allowed to capitalize at this high figure, only absolutely essential additions will be made, Mr. Thurman pointed out. As to what is considered essential, this will vary with each utility and with every case presented. However, there are in most cases different ways of taking care of lighting and power customers. A brief summary of a few of the different system follows.

In the standards of electrical service established by the Public Service Commission of Indiana, dated Jan. 2, 1918, Rule 31 provides that each utility shall, upon request for service, make free of charge any line extension necessary to give this service, when the income for the first year from the prospective customer is equal to one-half the direct cost of the extension. If the cost of the extension is greater than the estimated income for the year, the customer is required to deposit the cost of the extension above the free limit. If other customers are taken on this extension, the original consumer is to receive a rebate of an amount equivalent to the cost of the free extension for each customer so taken.

A number of companies are using this rule with reference to both light and power, particularly lighting consumers. In figuring the cost of the extension, the majority of utilities include the cost of material, cost of labor, including meter and meter installation, and to this add 10 per cent to cover cost of engineering and superintendence.

The Pacific Light & Power Company of Portland, Ore., uses the same method as given in Rule 31 (see ELECTRICAL WORLD, Feb. 9, 1918, page 311).

Some companies are requiring the total amount of the cost of extension to be advanced by the consumer, especially the power consumers. This is returned to the customer in energy, in some cases the total amount of the bill being applied each month, in other cases from 25 per cent to 60 per cent of the bill. Other companies use a plan in which the total cost is advanced and an amount equivalent to the 1914 cost is returned in service. This applies in the majority of cases to large extensions for additional power consumers. This seems to the author to be a very good method of taking care of high-cost extensions, owing to the fact that it is probable the utility will not be allowed to capitalize the full amount expended on these extensions.

One company at the present time is asking that the total cost be advanced and promises to return nothing. This applies only to lighting consumers. In this connection the question of how an extension made in this way can be capitalized arises. Another plan is to set a limit for cost and then to ask the customer to pay any additional expenditures. This plan applies particularly to lighting consumers, and the amount set as a limit to be spent for each lighting customer varies from $20 to $50. The consumer is required to deposit in most cases any additional amount, which is returned to him in energy. Under the terms of still another system the prospective consumer is required to purchase preferred stock to the amount of the cost of the extension. In most cases this preferred stock pays a dividend of 6 per cent, which really amounts to borrowing the money from the consumer at that rate. This seemed to the author to be one of the very best methods of taking care of extensions at the present time, owing to the fact that it not only secures the necessary capital but also gives the customer an interest in the company.

In securing data for this paper a circular letter was sent to each of the central-station members of the Indiana Electric Light Association asking for information regarding their method of taking care of extensions. Answers from seventeen central stations were received, which are classified as follows:

FOR LIGHTING CUSTOMERS:	
No extensions being made	5
No advance required	5
Extensions made according to commission Rule 31	3
Total amount advanced by customer, nothing returned	1
Customer required to buy preferred stock equivalent to cost of extension	1
FOR POWER EXTENSIONS:	
No extensions being made	5
No advance required	4
Advance required, but total amount roturned in energy	5
Customers required to buy preferred stock equivalent to cost of extension	1

A number of the replies from central-station companies, especially the smaller ones, revealed the fact that they were having trouble with their customers in securing necessary cash to finance extensions. In some cases this had assumed such proportions that it was necessary absolutely to call off plans for extensions of any kind, on account of prospective customers refusing to advance the money by any of the above methods. This, however, the author believed is because the applicants for service had not been educated up to a point where they understood that it was impossible at this time for a utility company to make an investment in any other way.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Investigation of the Fuel Problem in the Middle West.—A. A. POTTER.—This investigation of the fuel problem confronting power plants of the Middle West indicates that the total operating expenses have increased enormously within the year 1917-1918 owing to: (a) The increased cost of fuel; (b) the necessity of burning fuels of different grades with equipment suitable for one particular grade; (c) the greater amount of ash and other non-combustible matter; (d) the increased cost of labor and the poor quality of labor available; (e) the increased cost of repairs, supplies and new equipment. After detailing the methods resorted to in various states to meet the increased operating expenses, the author summarizes his conclusions in part as follows: The power plants of the Middle West are convinced that future emergencies can be averted by more adequate fuel storage, by greater attention to fuel economy, and by the more careful regulation on the part of the government of the quality of fuel leaving the mines and of the fuel-transportation facilities. In the case of power plants using natural gas, a gas-storage-tank capacity sufficient for a ten-day period is considered practicable. Such a storage capacity will take care of gas shortage during extremely cold weather. More attention will be paid in the future to the proper furnace design for high-volatile bituminous coals. The combustion chambers of the furnaces in the majority of the smaller power plants are not large enough for the air to mix with the gases given off from the fuel bed and before such gases come in contact with the comparatively cool heating surfaces of the boiler. Some attention should be given to the use of peat in certain parts of Michigan, Minnesota and Wisconsin for domestic use and possibly also for power generation. With the increasing scarcity and higher cost of coal and oil, low-grade fuels must be given greater consideration in connection with the generation of power. It has been advocated recently that the price of coal be regulated by the government according to the quality of the fuel produced, in order to give the coal operator a real incentive to clean his coal as he should. A detailed study of coal-car movements in the Middle West during the last four years discloses the fact that the average time required to move cars is extremely long. In most cases cars carrying coal will average less than 20 miles (32 km.) per day. When to this time is added the time required for empty cars to return to the mines, it is evident that the coal tonnage handled per car per year is very limited and very much smaller than reasonably efficient operation should produce. This delay is due partly to the practice by railroads of throwing cars on sidings and into yards with unnecessary switching, instead of delivering them to their destination in one or two hauls. Pooling of engines, cars and routes can be made to relieve this situation substantially. Relief can also come by so routing coal as to avoid as far as possible the congested terminals at the larger cities. Where freight cars must pass through such cities movements could be expedited by constructing belt lines around them. The coal shortage can also be reduced if greater efforts are made by all coal users to unload cars as soon as they reach their destination.—Abstract of paper read at convention A. S. M. E., June 4, 1918.

Boiler-Feed Water Softener.—In this paper water-softening apparatus for use in treating boiler-feed water is discussed. Water and chemicals are automatically added as necessary, and provision is made for stirring the mixture and filtering.—*Power*, July 30, 1918.

Use of Transformer with Series Alternating-Current Motor.—M. ERNST.—The machine which is under consideration in this article is the three-phase series motor with six brushes on its commutator. Used with the machine is a transformer, which may be connected in front of the machine or between the armature and the field. The latter arrangement is found to be preferable, because the transformer is smaller and cheaper, and also owing to the fact that the operating characteristics of the motor are improved. In the first place, the light-load speed is limited, which prevents the racing of the motor that would occur if the transformer were connected in front of the stator and rotor windings, and in the second place saturation of the transformer iron stabilizes the speed on heavy loads. The extent to which the transformer acts in this manner depends on the brush position. The above effects are deduced from vector diagrams of the motor, and curves are plotted showing the relations, two by two, between the torque, speed and brush shift, and also for the power factor of the motor, both for the case when the transformer is connected in front of the whole machine and intermediately between the stator and rotor windings.—*Science Abstracts, Section B*, May 31, 1918 (abstracted from *Elektrotechnische Zeitschrift*, Nov. 29, 1917).

Variation of Alternator Excitation with Load.—F. D. NEWBURY.—There are three primary factors that affect the amount of increased excitation required to maintain constant voltage of an alternator with increase of load: The magnetizing effect of the armature (or armature reaction), the reactance voltage of the armature, and the resistance voltage of the armature. The effect of the last two expressed in terms of exciting ampere turns is influenced greatly by the shape of the upper part of the saturation curve of the alternator. In considering this subject the distinction between armature reaction and armature reactance is important. The lack of this has been responsible for

considerable trouble in the past, and a better appreciation of it by present-day designers has led to a marked improvement in alternator operation on low power-factor loads.—*Electric Journal*, July, 1918.

Generation, Transmission and Distribution

Choice of Material for Pressure Pipes.—RALPH BENNETT.—In discussing the various materials of which hydroelectric pipe lines may be made, the author points out that steel is by far the most commonly used and is practically the only available material for very high head. Reinforced-concrete pipes require nearly as much steel for strengthening as is necessary in all-steel construction, but they are used commonly for heads up to about 100 ft. (30 m.). The wooden stave pipe, on the other hand, is a very good substitute for steel and has been used for heads up to about 200 ft. (60 m.). The wood is somewhat perishable and requires constant maintenance, but the present high cost of steel plate is extending the use of wood staves up to heads as high as 400 ft. (120 m.).—*Journal of Electricity*, Aug. 1, 1918.

Boiler-House Operating with Reference to Various Fuels.—KNUST.—It is admitted to be economically preferable to distill hard coal rather than use it directly under boilers. All bituminous coals should be subjected to distillation. The author investigates the possibilities of substitutional fuels for boilers. A mixture of one part of coke to two parts of hard coal yields no difficulties in working, and a mixture of one part coke to three parts brown-coal briquettes is also satisfactory. Thorough mixing is essential. If coke be used alone, the grate, air supply and stoking arrangements must all be modified. Using brown-coal briquettes instead of hard coal adds about 60 per cent to the grate and 14 per cent to the smokestack duty. A formula is given expressing the cash value of substitute fuels in terms of heating value.—*Science Abstracts, Section B*, May 31, 1918 (abstracted from *Elek. Werk.*, June, 1916, and *Elek. u. Maschin.*, Jan. 28, 1917).

Electric Plant at Canadian Smelting Works.—In this article a description is given of the Granley Consolidated Mining, Smelting & Power Company of Anyox, British Columbia. This company operates both steam and hydroelectric power plants, the steam plants being used when the flow of water is low. The equipment of the power houses is fully described, and details of the motor applications in both the mining and smelting industries are set forth. The present hydroelectric plant consists of two 938-kva. alternators with two 700-hp. overhung Pelton double waterwheels for each alternator. The auxiliary steam plant has a capacity of 6000 hp.—*London Engineer*, July 12, 1918.

Effect of Impurities in Coal.—Incombustibles in fuel have a detrimental effect upon furnace operation out of all proportion to the percentage of refuse contained. It has been asserted that when coal contains 40 per cent of refuse it becomes valueless as fuel. Information is given on the following subjects: Efficiency loss from ash, shipment of weathered coal, influence of sulphur on clinker, effect of impurities in coal, and effect of high-ash content.—*Journal of American Society of Mechanical Engineers*, July, 1918.

Electrophysics and Magnetism

Reversal of Spectrum Lines Produced by a Spark Under Water.—T. MASHIMO.—The study was made with metal electrodes of aluminum, zinc, cadmium and mercury. A greater range of frequency than those used heretofore was made use of in this investigation.—*Memoirs College of Science, Kyoto Imperial University*, April, 1918.

Effect of an Electric Field on the Spectrum Lines of Helium—II.—T. TAKAMINE and N. KOKUBU.—The paper describes the results obtained by further investigation relating mainly to the more refrangible lines of helium.—*Memoirs College of Science, Kyoto Imperial University*, April, 1918.

Telegraphy, Telephony and Signals

Inductive Effects of Alternating-Current Railroads on Communication Circuits.—H. S. WARREN.—A brief discussion of inductive interference in general is first given, including reference to the work of the joint committee on inductive interference in California. Inductive interference due to electrified railroads is then taken up, and various possible means for reducing such interference are considered. A description is given of four important installations of railroad electrification and the specific means adopted in each case for preventing interference, with the degree of success which has been met with.—*Proceedings A. I. E. E.*, August, 1918.

Miscellaneous

Present Situation Regarding Use of Natural Gas in New Orleans.—HOWARD EGGLESTON.—The difficulties of controlling natural-gas drillings when the gas was first encountered at the Terrebonne fields, near New Orleans, are enumerated. After a considerable study of the probable gas supply in these fields, the author concludes that it is immense. Now that it has been demonstrated that the gas can be controlled, he advises the city to either take over the pipe lines or control the sale price.—*Proceedings Louisiana Engineering Society*, August, 1918.

Analysis of Mine and Car Samples of Coal Collected in the Fiscal Years 1913 to 1916.—This is the title of a bulletin on the sampling and analyzing of the coals, being the third of a series including Bulletins 22 and 85. Bulletin 22, entitled "Analyses of Coals in the United States," can only be obtained now from the Superintendent of Documents, Government Printing Office, Washington, D. C. Bulletin 85, "Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1911 to 1913," is still available from the Bureau of Mines. The present bulletin presents thousands of analyses of coals collected from many hundred mines in the United States during the fiscal years 1913 to 1916. In order that the material in this bulletin may be used to supplement that presented in Bulletins 22 and 85, the same plan of geographical classification has been followed, the analyses and descriptions of the samples being grouped in alphabetical order according to the state, county and town near which the mines or prospects sampled are situated. The three bulletins, which do not conflict, constitute a very extensive analysis of the coals of the United States and should prove of great value to those who purchase large quantities of coal.—*Bulletin 123*, Bureau of Mines.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

PREFERENCE TREATMENT OF APPLIANCES AND SUPPLIES

Statement of the War Industries Board Affecting the Manufacturers of Electrical Supplies—Jobbers Are Recognized

The War Industries Board has issued a statement announcing that manufacturers of electrical appliances and supplies will be accorded a degree of preference for materials conditioned upon certain pledges limiting output to essential products. At present the vacuum-cleaner manufacturers are running along on what stocks they have and it will be decided later how much material they are to have if any. [Since the foregoing was written by our Washington representative the official statement printed in the next column has been received. —Eds.]

The situation as to washing-machine manufacturers is that they have been promised a small amount of material which they must distribute among themselves through their own association. The amount of material has not been definitely decided upon and the washing machine manufacturers are to return to Washington for further conferences, bringing a statement as to their own voluntary reductions in output.

Electric heating-device manufacturers have been told by the board to eliminate curling irons, coffee percolators, chafing dishes and everything else not absolutely essential. No luxuries among such appliances will be allowed and no selling campaigns will be allowed. The amount of material to be furnished electrical heating-device makers is also to be determined later.

The War Industries Board statement follows:

"At a hearing before the Priorities Commissioner and other representatives of the War Industries Board, the War Service Committee, representing electrical jobbers, presented their claims for preferred treatment to maintain their stocks for general distribution.

"As a result of the hearing, the Priorities Commissioner announced that manufacturers of electrical apparatus and supplies will be accorded a degree of preference for their materials to enable them to operate conditioned upon their pledging themselves to limit their output to essential products and undertake to see that such products are devoted solely to essential uses as that term may be defined from time to time by the Priorities Division. The manufacturers must be relied upon to police their own industry and also in a measure to police jobbers, distributers and retail dealers.

"It is believed to be in the public interest that jobbers should be permitted to maintain reasonable stocks from which government agencies, war industries and the civilian population may draw for their necessary essential requirements, provided the jobbers will pledge themselves rigidly to restrict the use of all stocks to solely essential uses and to reduce to an absolute minimum both jobbing and retail stocks. The jobbers will be relied upon to police their own industry and that of the retailers. Any jobber or retailer violating the pledge will be cut off from procuring further supplies."

CONSERVATION PROGRAM FOR VACUUM CLEANERS

Agreement Arranged by the Manufacturers with the Conservation Division of the War Industries Board

The War Industries Board authorizes the following:

Representatives of manufacturers of power-driven portable vacuum cleaners have agreed with the Conservation Division of the War Industries Board, in the interest of economy and conservation, to reduce their lines to not more than two models or sizes of such vacuum cleaners, to discontinue the manufacture of less essential attachments, and to discontinue the use of metals where such use is not absolutely essential.

Under the heading of "attachments" which are to be discontinued are included extra tools for cleaning other than floors or floor coverings, such as those for cleaning curtains, tapestries, wall coverings, furniture and other articles, and the extra suction hose which is cataloged generally with such attachments.

The manufacturers are to discontinue at once the addition of new models or sizes of portable machines and the use of any sort of metal for purely ornamental or other unnecessary purposes. These plans will result in an annual saving of at least 100 tons of steel, 5 tons of brass, 125 tons of aluminum and 1,000,000 ft. of rubber hose.

WEST PENN COMPANY TO BUILD $5,000,000 PLANT

It Will Furnish $3,000,000 and Balance Will Be Advanced by the Government—Appraisal After the War

An arrangement has been made between the United States government and the West Penn Power Company whereby that company will build a generating station in the Allegheny Valley at a cost of approximately $5,000,000 to provide more power for the Pittsburgh district. Contracts for two turbo-generator units of 20,000 kw. each have been let to the Westinghouse Electric & Manufacturing Company.

The company will furnish $3,000,000 and the government the balance. Three years after the end of hostilities the reproduction cost will be determined by three appraisers, one appointed by the company, one by the Secretary of War and one by these two. The decision will be subject to review by the War Department. The company will then pay the government such part of the $2,000,000 advanced by it as exceeds the estimated reproduction cost then.

Ask $200,000,000 for War Power Plants

Views of Government War and Industry Authorities on the Measure to Provide National Fund for Construction of Additional Facilities to Meet the Emergency Need for Power

HEARINGS before the committee on interstate and foreign commerce of the House of Representatives, now in progress at Washington, show clearly the large military purpose behind the two-hundred-million-dollar power-plant emergency bill. The principal provisions of the bill were published in last week's issue of the ELECTRICAL WORLD, page 365. Herewith there is printed the substance of part of the testimony, begun on Aug. 23.

Secretary of War Baker

When Secretary Baker testified before the committee it was for the purpose of making a broad general statement which should express, after conversation with President Wilson, the attitude that should be taken by Congress toward an increase of the power facilities of the country for the purpose of assisting in winning the war.

Secretary Baker said that six or eight months ago it had become apparent that there would be a power famine, and that he had found the situation affected not only the War Department but the Navy Department and the Emergency Fleet Corporation.

"It was suggested, as I recall it," Mr. Baker said, "by President Wilson that the matter be referred to the War Industries Board as the proper agency to make a comprehensive survey of the entire field."

Secretary Baker then related the steps that had been taken. He alluded to reports which had been made to him and conversations he had had with Bernard M. Baruch, chairman of the War Industries Board, and others, as well as with Frederick Darlington, chief of the power section of the War Industries Board, and Lieut. W. W. Stanley, U. S. A., Mr. Darlington's assistant, who presented the case to the committee for the War Industries Board in the absence of Mr. Darlington.

Secretary Baker spoke of Joseph B. McCall of Philadelphia as having been called into consultation and of the fact that certain Cleveland engineers whom he knew personally had been taken into consultation. Secretary Baker mentioned those who had been called into the consultation by the government as representing the Navy Department and the Emergency Fleet Corporation. He said that in particular he had consulted General Keller of the Engineer Corps of the army.

THREE DISTRICTS WHERE CHIEF SHORTAGE EXISTS

After creating this background of authorities the Secretary of War said, in part:

"The three principal shortages center around the so-called Pittsburgh district, which includes a very wide reach of country around Pittsburgh devoted to manufacturing industries; then again Philadelphia, and a section of New Jersey. We attempted to meet the emergency by apportioning these three districts, allowing the War Department, so far as it could out of funds at its disposal, to supplement the power in the Pittsburgh district; the same for the Navy Department in the New Jersey district, and the same for the Emergency Fleet Corporation in the Philadelphia district.

"It required very great ingenuity to work out a plan," the Secretary of War continued, "by which the funds in the War Department could be made available for the establishment of supplementary power supplies."

Secretary Baker explained to the committee that in the search for methods of creating more electric power for the industries of the country the Emergency Fleet Corporation might have some elasticity in the use of its funds when it comes to creating more power and that the Navy Department has somewhat less elasticity. He said that all of the government departments had been working at the problem for four or five months.

"So far as I know," he said, "the only progress that has been made is that the War Department has made a contract in the Pittsburgh district with a power company by which we undertake to buy a very large lot of power. By anticipation we supply some of the money necessary for the enlargement of the existing facilities."

The Secretary of War said that the Pittsburgh contract is more or less of a model contract. He said it has been worded most carefully by men of very great intelligence and ingenuity. "But the Pittsburgh contract," the Secretary said, "is only a drop in the bucket."

THE GOVERNMENT'S PROPER COURSE

Mr. Baker then devoted himself to a discussion of whether the government should step in and supplement the facilities of the power companies, or whether, to use his own language, the companies "could be required or relied upon to supplement their own facilities." He pointed out that the public utilities of the country were financed up to the limit before the war began, and he said that there are very few forms of industry in which there have been as intricate financing as there has been in the electrical industries of this country.

Mr. Baker then took up the inability of the public utilities to borrow money to make the needed expansions the government wants. He analyzed that difficulty, speaking of the substantial percentage of the cost of things above normal times. In this connection he said:

"The attitude of these companies was that if they were called upon to increase their generating capacity by a very large addition the difference between the normal cost and the war cost ought to be borne by the government, in whose interest the additions were made, and that some way of having government aid in their finances would have to be devised."

The Secretary of War explained that the bill commits to the President's discretion the particular mode of dealing with a public utility in any particular place.

At this point Secretary Baker's statement ended and he was interrogated by the members of the committee.

Explaining what the situation is as to cost, Mr

Baker said: "Using figures which may or may not be accurate, but have been used as the basis of discussion, it is said by the power companies that the plant which to-day would cost $100 to install could in normal times be installed for $60, and the contention of the companies is that the government ought to pay that difference of $40 because the plant would not be expanded by its owners to meet the war needs unless the government's interests required it to be done. The theory upon which we have been attempting to meet that contention is that we ought not to jump at an estimate of the difference beween peace-time value and war-time costs, but ought to make an arrangement by which the government will aid in the financing as far as may be necessary and allow the exact amount of the government's contribution to be determined after the war is over and things have returned to normal by an appraisement of the value of the plants to the company, and let the government then pay the difference between the appraised value and the cost during war times."

Representative Esch asked if it was the primary purpose to install the power plant at the mine mouth and thus save haulage of coal. Secretary Baker said that that should be done wherever it could be done. It could not be done in some places, as, for instance, in the Philadelphia district, where the transmission loss would be too great.

Secretary Baker said that it would be a mistake to pass the bill without the precaution contained in Section 6 providing that no structure affecting the navigable capacity of any navigable waters shall be constructed or installed until the plans have been approved by the Chief of Engineers and the Secretary of War. He thought, however, that the language might be amended to read "or such other body as may be authorized by Congress to pass on such subjects."

No New Hydroelectric Plants Contemplated

Mr. Baker said that he believed it was not any part of the present plan to construct any hydroelectric plants, although there may be some enlargements of some existing plants. The government is seeking very much more rapid power development.

Secretary Baker said that some companies are already capitalized to the limit. No one rule could be laid down and applied to all. One of the largest power plants and one of the most advantageously located, the new station at Windsor, W. Va., is almost at the mouth of the mine and can get along without government aid of any kind. In other plants in the Pittsburgh district it was found that the financial condition was such that the companies apparently were wholly unable to borrow money to go forward with their expansion.

"I have no theory of dealing with them," said Secretary Baker, "except that the government ought to extend as little aid as it consistently can to get the thing done and under as great safeguards as can be devised in order to make the government's ultimate contribution, its loss because of war costs, as little as possible and to get back for the government when the war need is over as much as can be salvaged of its expenditures."

Secretary Baker, answering an inquiry from a committee member, said that there is existing power to take over plants and operate them on government account, and the War Department has taken over some and is operating them.

Representative Dewalt asked if it were true that the supply of power of some large business enterprises had been cut by the federal authorities from 25 to 50 per cent because of the shortage.

Secretary Baker said that he had no doubt of it, and perhaps much more than that in some instances.

Representative Dewalt cited the case of some plants whose supply had been cut 25 per cent, while another order about to be issued would make another reduction of 25 per cent. He said that this would virtually compel the mills to close.

Mr. Baker did not know of the particular cases, but said that they are excellent illustrations of the situation, and that even more exaggerated restrictions will be found to be necessary in the Niagara district. It is not intended, as Secretary Baker understands, in the operation of the bill, to attempt to increase the power supply so as to be able to take care, without limit, of all the customers, but to increase it adequately to take care of all those whose continued operation is important to the prosecution of the war.

Representative Dewalt asked about the clause providing that the President may retain any property and operate any plants for such time as he may deem necessary or advisable for the purpose of selling or otherwise disposing thereof. He asked whether that did not look almost like permanent ownership and if it might not be so construed.

Secretary Baker in his reply said in part: "I think that would give the President power to retain permanently things of that sort. I think it is highly important that he should have that power, for two reasons. In the first place, any fixed period within which the things would have to be sold might require the government to sustain a very great loss because of the inopportuneness of the time of sale. The second reason is that some of these large power additions may very well be built near to a permanent government establishment of a large kind. If there should be among these plants a large power-plant addition which was especially well adapted to be a continuing adjunct to a government plant, the President ought to retain it as a permanent government asset."

Representative Dewalt—While recognizing the force of what you say in the individual instance that you have mentioned, I think you still recognize the fact that there is a rather well-grounded sentiment against public ownership of such utilities—that is, federal ownership of such utilities—and I merely throw out that suggestion. Do you not think it would be wise to amend that section so that this possibility, not probability, of unlimited federal control and ownership of public utilities should in some way be hedged about?

Government Ownership Discussed

"Personally," replied Secretary Baker, "I do not share the prejudice against government ownership of enterprises of this kind, so that my natural disposition would be to favor rather than to discourage the retention of these things by the government in places where it was appropriate."

Representative Dewalt—With all due respect to your opinion, nevertheless I judge there are others who have a different opinion, possibly a larger number having the same opinion that some others may have contrary to yours, and therefore, would it not be well, in your judgment, to somewhat hedge that section about, and, if so, will you be kind enough to have your attorneys inform me because, perhaps, the other members are well informed on that subject?

Secretary Baker—I would not be able to suggest the language which might be appropriate to carry out that idea. The lawyers will be here and will doubtless be able to do it. But I will say generally that I agree with you perfectly. This is not the place to settle the great policy of federal ownership. What we want to do now is to get the power.

Mr. Baker also added, a few minutes later: "I should say that when we are doing things to make war we ought to do things having that sole object and purpose in view and not attempt to accomplish a collateral object." He thought that in passing legislation of this sort the question should be left wide open so that the succeeding Congresses will be free to determine the great peace policy when the time comes for them to turn their attention to it.

Bernard M. Baruch

Bernard M. Baruch, chairman of the War Industries Board, in beginning his testimony said that his attention was called to the matter some time ago in a general survey of the war program, that which involved the War Department, the navy, the Shipping Board, the Emergency Fleet Corporation, the railroad administration, etc.

From time to time sporadic instances were brought to the attention of the board as to the lack of power. A study showed that it was necessary to do something immediately. It was difficult for any one department to do this because the work in any one district involved work for all of the departments, and it was difficult to tell exactly in what proportions each of the departments was involved, and it was also impossible to tell how many of the sub-contractors who did not have direct contracts with the departments were involved.

In endeavoring to meet the situation the board had the departments make studies to see whether they could possibly furnish the money, and in only one or two instances in the War Department was this found possible.

The board feels not only that it should help work out the war program, but that it should look after the necessary and vital civilian needs—that is, the heating, lighting and transportation necessary in order that the populace may live in ordinary comfort.

"We have studied the various points from the standpoint of seeing how much we can save by reducing the less essentials," said Mr. Baruch, "and we have found on examination that it was impossible to meet the war program even if we cut out the less essentials entirely, and we have come to the conclusion that the only way this can be done is to do it in this way.

"I asked the gentlemen who were drawing the bill not in any way to have it drawn so that it would accelerate or retard public ownership, as that was a moot question, and, in fact, to draw it in such a way that only the emergency war matters should be met and that any other great questions involved in it be left to be decided at another time and leave the status quo where it is to-day.

"This bill is drawn for the purpose of giving us the needed emergency power as quickly as can be done and with as little expense and with as little loss to the government as possible. It has been made wide in its power because it is rather difficult to lay down a rule which would cover a large number of cases. Each individual case will have to be taken up by itself.

"I cannot impress upon you too strongly the grave necessity for immediate relief. How it will be afforded I am not prepared to say now. The winter is coming along, and in this bill is not only contained relief for the present but relief extending into the program of 1919 and 1920. It is not proposed that any one who will administer this bill will do things other than those absolutely necessary for the military program, and when I say the military program that involves all the war activities."

Representative Esch called attention to the fact that the consideration of the steam stations proposed would mean an increased demand upon the coal supply, and Mr. Baruch in confirming this added that the bill has the approval of Dr. Garfield, Fuel Administrator. Representative Esch said that he had led to that in order to see whether there was coördination in the demand for an increase of power from steam with the Fuel Administration, which was trying to speed up coal production.

Mr. Baruch said that they were very insistent upon this because some of the departments had anticipated putting up isolated plants for some particular purpose. The Fuel Administrator objected to that because he thought it was more economical to use coal in a large central plant or use it where the large central plants had been increased.

In speaking of the coal situation Mr. Baruch declared that the real reason why the legislation is wanted is the immediate need of power in the quickest way to get it, and he believes that the cheapest way to get it and the only way to get it is as suggested by this bill. He said later in regard to the legislation:

"We have got to have it to get our war program through, and it is the only possible way we find of getting it at the time we need it. The real dominant factor is the absolute necessity of power and to get it to-day and not to-morrow."

Representative Dewalt asked what means of relief exist now.

The Situation at Norfolk

Mr. Baruch said he had not any. He had tried every possible means to get the departments to furnish relief. There is a serious situation in Norfolk to-day, and in his opinion the war program there is going to be seriously interfered with. The population has risen rapidly from 180,000 to 450,000. The situation there in regard to power as well as to some other things is almost tragic. "We have made efforts in scattered directions," he said "to bring about some little relief but have brought no relief in any amount. Time is the es-

sence in this thing, and it is not a thing that wants to be done to-morrow but to-day."

Mr. Dewalt asked whether Mr. Baruch had from his own investigations ascertained the fact that the electric power producing companies are not able at this time to finance the matter themselves although they would be willing so to do.

Mr. Baruch—You are quite correct.

Mr. Dewalt—They cannot get the capital?

Mr. Baruch—It is absolutely impossible.

Mr. Baruch replied to questions on the situation in New Jersey, a study of which shows that the manufacturing which has to take place there in increasing amount is going to need much more power than is now available.

Replying to an inquiry of Mr. Hamilton as to what he would do in a case like that, Mr. Baruch continued: "A study would be made of each particular case. One of the things we had in mind was carrying across a line from New York City, taking power from the Edison company and getting about 20,000 kw. more, but we have been unable to get any department to do that. Being impressed with the necessity of immediate action, I tried to get Mr. McAdoo, the Railroad Administrator, to carry the power from the Edison company through the Hudson tubes, which are under his command, but it does not make any difference who does this so long as the thing is done. We want to get the power and that seemed the quickest way."

Mr. Baruch also declared that in almost every instance existing facilities would be used by enlarging them.

Replying to a question about the details of the financing where an existing company enlarged its facilities, Mr. Baruch said: "We would make the best trade we could, all the time looking to the fact that we wanted the power and wanted to get the government's interests as fully protected as possible and get all the money back we could. In order that there may be no misconception about this, some of this money will in all probability be war waste. I do not want you to think that where we advanced money we are going to get it all back.

Mr. Hamilton—And what you cannot get back you are going to consider invested in the cause?

Mr. Baruch—Yes sir, that is exactly the fact. I could not have stated it better.

Later Mr. Baruch added: "There is no desire so far as I am concerned or so far as the men I have asked to draw this bill are concerned to either accelerate or retard government or municipal ownership. We want to keep that question out of it. This is a war emergency, and we want to keep the conditions just as they are to-day."

Lieut. W. W. Stanley

Lieut. W. W. Stanley, executive assistant to Frederick Darlington, chief of the power section, War Industries Board, testified for Mr. Darlington, who was unable to be present. He spoke of the new partial surveys made of the situation, mainly by army engineers assigned to the War Industries Board by the Chief of Engineers. A great deal of information was gathered from the power companies.

"They have been very glad to help us in every way they could," said Lieutenant Stanley, "but in each case before we adopted that information as our recommendations or amended it, we have analyzed that information ourselves with the government men so that we feel that the evidence I am going to submit is entirely unbiased."

The situations were very largely in the eastern district. The Niagara district was not handled because that was already being handled by R. J. Bulkley and General Keller for the Secretary of War. That is a separate problem, full of international complications.

"The way in which the problem was attacked was something like this," Lieutenant Stanley testified: "Manufacturers and government agents depending on power for the manufacture of war munitions and material appealed to the War Industries Board when they began to find they could not get adequate service. Army engineers were sent to make examinations of the situations, the generating apparatus, the efficiency, operating conditions, etc. They took the reported loads, customers' records, and visited customers to see that they were operating with economy and on war work. They also checked the construction work of consumers and the amount of power they were asking for the future."

"This kind of survey," said Lieutenant Stanley, "has been made in the most critical places and most of the larger places. It has not been made in full, although it has been made to the extent of establishing the fact that there is a shortage, that the situation is normal, or that there is a surplus of power in a great many of the smaller places.

"As a part of the work," said Lieutenant Stanley, "information was also gathered as to the amount of available power that was used for several purposes but principally to try to regulate as far as possible the placing of more industrial work, so that it would be allotted where there was sufficient power."

In the Philadelphia, Chester and adjacent district there is a present installation of about 220,000 hp. There will be required during this year and next year on the basis of orders already placed about 120,000 hp. additional. In round figures the estimated cost of providing this will be $14,500,000.

New Jersey has a present installation of about 303,500 hp. It will require this year and next year at least 14,000 hp. [40,000 hp.?], estimated to cost $5,500,000.

Pittsburgh District's Needs

The district called the Pittsburgh district, including the territory from Akron, New Youngstown, Pittsburgh, Connellsville, Wheeling, Canton, Massillon and back to Akron—the western portion of Pennsylvania and the eastern portion of Ohio—now has a generating capacity of 456,450 hp. It will need this year and next year 440,000 additional hp., and the estimated cost is $35,000,000.

Baltimore, Lancaster and the territory between have a present installation of 167,460 hp. They need 53,000 hp. more, and the cost is estimated at $3,942,000.

All these estimates are on the basis of existing contracts for the sale of power to manufacturers, taking into consideration also the normal expansion in the use of power by plants.

The Pennsylvania anthracite region includes the Hauto plant, now producing 26,000 kw. Fully equipped with boilers, it could develop 37,000 kw. This district needs 53,000 kw. additional. This involves an estimated

cost of $8,000,000, including a considerable amount of transmission.

Replying to an inquiry as to other plants in the district which might be connected with the Hauto station, Lieutenant Stanley said that so far as had yet been found the other plants would have a very small amount of surplus power this summer but would have no surplus this fall and winter. The quickest solution to the problem in that district is to increase the Hauto plant.

In 70 of the larger New England plants, out of a total of about 260, there is 1,200,000 hp. They will need 75,000 hp. additional, and the cost is estimated at $14,625,000. That will be probably best and most quickly obtained by increasing the steam reserve that can be fed onto the lines of the New England Power Company.

Lieutenant Stanley said that about 1,000,000 hp. is installed in the Southern States. It is estimated that the additional power required there for 1918 and 1919 is 135,000 hp. It will cost approximately $15,000,000. At present the cotton-manufacturing districts, supplied partly by hydroelectric systems and partly by steam, in North Carolina, South Carolina, Georgia and Tennessee, are short of power. This is due to unusual water conditions and the fact that the stations are fully loaded for normal conditions. The Southern situation is susceptible, said Lieutenant Stanley, of fairly rapid increase in power resources. It is not in the congested district, which means that it has available fuel, labor and railroad transportation. This district is more properly described as the Southeastern States.

A miscellaneous group of smaller power systems was mentioned by Lieutenant Stanley as existent in the Eastern and Middle West States. The particular systems found to be short have a capacity of about 350,000 hp. and need about 250,000 hp. more. The estimated cost of this is $31,250,000.

Pacific Group Under Survey

The last item in the summary is the Pacific group west of the Rocky Mountains now being surveyed. Only preliminary information has been obtained on that. The territory is short of power, owing principally to the increase in shipbuilding on the Pacific Coast, and a preliminary estimate of desirable expenditure for this year and next year is not less than $10,000,000. The total figures show a present installation of about 3,716,210 hp., and an additional 1,233,300 hp. is required at a total cost of $138,427,000. The Geological Survey had listed up as the essential plant power in the country, not including any power in individual plants, covering the electric light and power and electric railway situation, a total of 13,000,693 hp.

The normal growth in installation, said Lieutenant Stanley, is generally accepted by engineers as an average of 10 to 12 per cent per year. The total increase listed, 9 per cent of the present installation, is a sub-normal increase, indicating that the companies have not expanded during the war as they would have done normally.

Lieutenant Stanley said that it was not intended that the figures should be final so far as the whole war program is concerned. It could not be predicted in power what the increase of the army to 5,000,000 men would mean. These figures do not make allowances for that increase. The figure of $200,000,000 is not too large by any means, because as fast as the war program develops power work all over the country will have to be started this fall and next winter and next spring, as soon as weather conditions are considered favorable, to get the plants built in time to pick up the load that will come on as the army and navy contracts are being fulfilled.

In the Central West, Michigan, Illinois, part of Wisconsin, Ohio, Minnesota and some of Kentucky have been surveyed. There have also been surveys at places where shortages have appeared in Oklahoma, Missouri and Arkansas, and a little has been done in Texas. Something was done in Iowa, and Lieutenant Stanley thought that the representatives had been in Nebraska. Lieutenant Stanley guessed that more steam power than water power was involved.

One of the things that have developed is the problem of interconnection of existing companies so far as possible and desirable. This will undoubtedly have to be done in a number of cases. Lieutenant Stanley also indicated that the board regards other work than war industries as important; while not on the basis of war work, power must be supplied for these purposes.

Clarence Dillon

Clarence Dillon, representing the War Industries Board, testified that some time ago the War Industries Board began to get complaints from manufacturers in the Philadelphia and Pittsburgh districts who had government contracts that they could not get enough power. It was found on investigation that there were very large demands for power for actual war orders and that the power could not be supplied. The same state of affairs was found in the New Jersey district. Representatives of the different power companies, called to Washington, said that they would have to have financial help to furnish more facilities. Afterward, at a meeting in New York, with company representatives and their bankers present, it was shown that the companies were unable to raise capital.

Mr. Baruch, said Mr. Dillon, then went to the different departments to see if they had available funds. It developed that the Navy Department had none. The Shipping Board had a small fund. The War Department had no funds available for this purpose, but could secure probably small amounts which could help in a very insignificant way. Mr. Baruch then asked "Mr. Meyer and some other gentlemen to prepare a bill to relieve this situation."

When it was found to be impossible to do anything before the recess, the matter was taken up with the three departments mentioned, and the three districts were divided, giving Pittsburgh to the War Department, Philadelphia to the Shipping Board and New Jersey to the navy.

Nothing has been done by the navy in New Jersey, said Mr. Dillon. Nothing has been done by the Shipping Board in Philadelphia, although the Shipping Board is negotiating with the company there to try to reapportion the power to get some small relief pending this legislation, but any such relief will be infinitesimal. Mr. Dillon referred briefly to a contract made by the War Department with a company in the Pittsburgh district whereby the department furnishes 40 per cent of the cost of the new development and the company

financed 60 per cent. The department will absorb any war wastage, and the plant will be taken over after the war by the company at an appraised valuation at that time.

"This contract," Mr. Dillon added, "was very clumsy and difficult to handle because the War Department had no funds for that purpose. The only way it could help was to make advance payment on the power purchased and then to arrange an adjustment of the price of the power purchased in order to take care of the war wastage on the high price of construction at this time."

Mr. Dillon said that it was impossible to get relief in this way "and that unless we get some broad, comprehensive way of working the situation out we are going to fall down on our war program. I am convinced that a very large part of this money will be returned to the government," he added.

Representative Esch asked if the army appropriation bill a year ago did not give the War Department power to commandeer any plant or industry necessary for war production.

Mr. Dillon said that that was true, but there is no one power plant that is necessary for power production for the army. A commandeered plant would have to be commandeered for the benefit of the Shipping Board, the navy, the civilian population and every one else.

WAR WASTAGE OF CAPITAL

Answering a question by Representative Esch as to the estimate to be put upon the war wastage of the capital, Mr. Dillon replied:

"Whether equipment is going to go back to the prices that existed before the war is largely problematical. The general opinion is that it will go off somewhat from present prices, but there is an equally broad opinion that it will not go back to the lowest prices that existed before the war. The terms of the advance will be such that as power is delivered a certain amount of the advance will be taken care of, and the longer the government takes power the more of the money advanced will be returned. These contracts will be made each one upon its merits and each will undoubtedly have different terms and conditions. But if you use that power for any length of time it is reasonable to suppose that a very large part of the money will be recovered. If you increase those plants and the war comes to a very abrupt termination and you do not use a great deal of that power, the war wastage of that equipment may be larger. The government need not sell those plants at the termination of the contract. That can be determined by arrangement.

There are areas not particularly congested, said Mr. Dillon, that are also short of power. The particular places causing worry at present are in the congested districts where the intensive investigations were made.

Mr. Dillon, replying to a question, said that he did not contemplate that much of the additional plant facilities would be dismantled after peace. To the extent that they survived the investment would not be wasted. The money should be loaned by the government just as if it were a private bank.

"I personally should think that immediately after the war," Mr. Dillon said, "the industries that were using the bulk of this power would not have use for all the power that they had been using and therefore there would have to be a redistribution of that power, although other industries to which we are denying power now would then be ready and willing to take power so there would be a readjustment of that power."

Mr. Dillon expressed the belief, following an inquiry by Representative Winslow, that with the power that it is contemplated will be produced there will be more than the normal amount on hand for all purposes when the war is over.

Mr. Winslow asked if there was anything in the bill that contemplated the final control of the power by the government. Mr. Dillon said that it was agreed by every one connected with the draft of the bill that this question should not be brought into the matter.

Speaking further on the use of the power after the war, Mr. Dillon said:

"In the manufacture of war essentials we get right down to the fundamental industries of our modern life. Practically every industry, with few exceptions, is called upon for increased production, so that the use of this power after the war depends largely upon our national life after the war, on general industry and trade. We are not using this power for the conduct of a business that is absolutely useless when the war is over."

Replying to Representative Parker of New Jersey, Mr. Dillon said that the tendency for manufacturers to connect with a central station is marked.

Representative Parker—And if that tendency remains after the war, and there is such saving, may we not fairly expect a great demand for power after the war from various industries which are now not connected with central power plants?

Mr. Dillon—We may, and that may be sufficient to use the entire power extension that we are now making, by the fact that we can furnish power to the small consumer cheaper than he can make his own power, and if he is now making his own power he would discontinue it, which might take up the entire slack that would come after the war.

Later in his testimony Mr. Dillon reiterated his opinion that eventually all the power made in the plants will be used in the normal processes of business.

CONVERTING THE LESS ESSENTIAL INDUSTRIES

Representative Winslow asked whether the board is looking ahead to what might be called the second stage of a demand for power, namely, for those industries which are being classed as non-essential at the moment, but which ultimately are bound to find a field for their products.

In replying Mr. Dillon said that a division of the board is studying that and figuring whether "less essential" industries can be converted to more essential work. In doing that there will be greater production capacity in the country and greater demands for power.

Mr. Winslow—In view of that, are you making your provisions sufficiently elastic to accommodate properly those less essential industries?

Mr. Dillon—That is our intention.

Representative Winslow—Or will you have to come back and ask for a further consideration?

Mr. Dillon—I think that will have to take care of

itself. At the present, as far as we can see, this bill will take care of the needs of the country immediate and throughout the coming year 1919. What the program will be after that and the demand for power depend upon what the military program is. As we see the military program to-day we hope that we have taken care of the situation with this $200,000,000.

It was explained by Mr. Dillon that the power shortage still exists when the supply has been diverted from industries whose product is not as vital as those of other industries.

LIMITS COAL STORAGE BY INDUSTRIAL PLANTS

United States Fuel Administration, to Meet Special War Demands in East, Restricts Amount of Coal to Be Stored

The tremendously increasing demand for coal for special war purposes in the eastern part of the country, particularly for the navy and transport service, is making it necessary to draw more heavily on the Eastern coal fields than was originally contemplated.

In order to decide how best to secure this coal for these purposes with the least disturbance of the coal supply moving to other industries, a meeting of all state fuel administrators east of the Mississippi and also for the states of Minnesota, North Dakota and South Dakota was held in Washington on Aug. 20.

It was decided that to accomplish the desired result it would be necessary to limit the amount of coal storage that industrial plants would be allowed to accumulate and to carry on hand and to fix a uniform amount for each state.

United States Fuel Administrator Garfield announced the basic policy of the Fuel Administration as to storage as follows:

Coal in excess of that required for current operations shall be delivered to plants not on the preference list of the War Industries Board only when it is not in demand for use before April 1, 1919, by consumers on said list, namely, railroads, the federal government, states, counties, public utilities, retail dealers, or manufacturing plants on the preference list.

In carrying out this policy, allowance shall be made for differences in distance from the mines and for differences in transportation conditions which may require more or less storage at the beginning of winter to insure uninterrupted operation until the following spring.

The maximum number of days' storage for bituminous coal indicated for the several states or parts of states defined hereafter are as follows:

	Steam Coal			By-Product and Gas Coal		
	Public Utilities	Preferred Industries	Non-Preferred Industries	By-Product and Gas Plants	Preferred Industries	Non-Preferred Industries
Maine	120	90	30	120	90	0
Massachusetts, Vermont, New Hampshire, northern New York	90	60	30	90	60	0
Connecticut, Rhode Island	75	45	20	75	45	0
Southern New York, New Jersey, Delaware, eastern Pennsylvania	30	30	15	45	30	0
Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida, Western Ohio	30	30	15	45	30	0
Western Pennsylvania, West Virginia, eastern Kentucky, eastern Ohio	30	20	15	45	30	0
Lower Michigan	90	45	20	60	60	0
Illinois, Indiana, Missouri	..	..	..	60	60	0
Wisconsin, Minnesota, North Dakota, South Dakota, upper Michigan	..	..	..	90	90	0

The following report, framed by a committee of state fuel administrators aided by officials of the administration, was adopted by the conference and concurred in by Dr. Garfield:

It is understood that these limits are mandatory, and each fuel administrator is expected to see that the different classes of consumers are not allowed to exceed these limits. At the same time, it is understood that particular cases may require special treatment by a state fuel administrator, either by way of granting more stocks of coal than are indicated by these limits or by restricting them to a less supply than indicated by these limits.

Where a state administrator decides that the maximum limit should be exceeded in a special case for some special reason, he shall have authority to grant a revocable increase in writing for a specific added number of days. The administrator shall report each such specific case in writing immediately to the United States Fuel Administration at Washington, which may in writing disapprove the extension granted by him. Otherwise it shall stand subject to action of the state fuel administrator.

Any company or concern which is permitted under the zoning regulations now or hereafter in force to obtain coal from Illinois, Indiana, western Kentucky, or from mines west of the Mississippi River, may retain such reserve stock of coal as it shall have on the effective date hereof on condition that such company or concern shall thereafter use screenings or mine run only for its current necessities and shall obtain such screenings or mine run for current use only from such last-mentioned fields.

WAR CONVERSION OF MANUFACTURING PLANTS

Plan Is to Develop Business of the Country as Though It Were One Enormous Concern

Charles A. Otis, chief of the Resources and Conversion Section of the War Industries Board, informed New England manufacturers in an address at Portsmouth, N. H., Aug. 24, that so far from aiming to interrupt the normal industrial life of the country, the government departments propose to do everything possible to encourage and even to increase the manufacture of ordinary materials except where such production would interfere with the successful prosecution of the war.

"Every resource of the country necessary for producing the supplies and equipment of the army, navy and other departments will be utilized," Mr. Otis said, "but beyond this point the industrial structure of the country need not fear that it will be handicapped.

"Through the war resources committee," he added, "the business men of the country become the army of industry backing up the boys at the front, while the government aids as it can in shaping the work of both to a common end. It is obvious that as we progress the government will be an enormous buyer. It is facing us now that many industries must immediately develop their organization along the line of war requirements or go out of business. To save this very serious situation is the work of the Resources and Conversion Section, and its work is dependent upon the hearty support of every business man in the country."

Mr. Otis continued:

A careful study is being made of the fuel and power situations so that districts loaded with work will not increase beyond the limit of the power and transportation facilities of the country, but others be developed for the

work. It is plain that the whole story is to develop the business of this country as though it were one enormous concern with its various departments. There is not a man in the United States to-day, I feel sure, who has any fear as to our soldiers. I think the fear that is creeping into many of us is the enormity of the business behind them. When we consider that as our men increase abroad the supplies must increase in like proportion—the supplies right behind them, a little way behind that, on the shores of our allies, on the ocean going over, on our own shores and back to the factories—we get a picture of the stupendous operations, and everything must be so arranged that the supplies go in an orderly way.

Our soldiers must not be in want of shells yet oversupplied with food; nor must the reverse occur. The departments of the army and navy are doing wonderful work, and it is for us to see that they get all the information, all the assistance, all the development of resources and of the orderly conduct of business to help them in their great task. We must keep our people contented, we must give business every possible chance, but we will win this war, and a large part of it is up to us, the business men of our country.

Special emphasis was placed on the necessity of manufacturers who have a large share of government work subletting contracts wherever it can be done in the interest of greater speed and efficiency in production. It is the duty of such manufacturers, Mr. Otis stated, to inform the regional adviser that they are willing to give some of the details of their work to other plants which are equipped to take them in hand. It has been brought to Mr. Otis' attention that smaller manufacturers are ready and eager to engage in such co-operation, but are often unable to obtain the work. He expressed satisfaction at the work accomplished in New England. Stuart W. Webb is regional adviser for Region No. 1, embracing all New England except Connecticut and western Massachusetts, his headquarters being at the Boston Chamber of Commerce.

ATLANTA RATES INCREASED BY GEORGIA COMMISSION

Estimates Indicate that Advance Is Substantially Less than the Company Asked—City Council Will Contest Ruling

The Georgia Railroad Commission has handed down its decision regarding the application of the Georgia Railway & Power Company, Atlanta, for a general increase in lighting, power and gas rates and electric railway fares.

The report indicates that it is the commission's idea to allow a return of 6 per cent and a depreciation of 2½ per cent on the consolidated market values of the capitalization of the Georgia Railway & Power Company and the Georgia Railway & Electric Company (excluding the Atlanta Gas Light Company and Atlanta Northern Railway), approximately $39,500,000, as compared with a total outstanding of $66,250,000 stocks and bonds.

It is difficult to predict just what the effect in income will be, but rough estimates place increases per annum of $36,000 on residential lighting, $72,000 on retail power and $170,000 on wholesale power, and a decrease of $60,000 on commercial lighting.

The company asked for increases from 15 to 33⅓ per cent in the way of a surcharge, but the commission's rate expert made a number of changes in the type of rates, especially for power, which will decrease the income from commercial lighting, seasonal and municipal customers and increase the income from industrial consumers.

The Atlanta City Council has indicated that it will carry the case to the courts.

GUY E. TRIPP IS MADE A BRIGADIER GENERAL

Former Chairman of the Westinghouse Electric & Manufacturing Company Promoted to Be Assistant Chief of Ordnance Department of Army

Col. Guy E. Tripp, recently chairman of the board of the Westinghouse Electric & Manufacturing Company, who was given leave of absence by the directors of the company in order to devote himself to the government service for the duration of the war, has been appointed brigadier general.

From chief of the production division of the Ordnance Department of the army, General Tripp has just been promoted to be assistant chief of the Ordnance Department.

COMMISSIONS DECLINE TO ORDER UTILITY EXTENSIONS

Connecticut and Massachusetts Boards Refuse to Direct Companies to Make Expansions Desired by Customers in War Time

Two New England public service commissions—Connecticut and Massachusetts—have issued three findings in which petitions for the extension of service were refused.

In the case of Hosford et al. vs. Connecticut Light & Power Company, Waterbury, five residents of a section of the town of Plainville demanded a line extension for power and lighting service into a farming district about a mile from the existing lines. At the hearing very little evidence was introduced which warranted the commission's requiring the construction of the line under present war conditions, and the petition was accordingly denied without prejudice, subject to the consideration of another of the same tenor after the war.

Another case was a petition by Spencer et al. vs. Hartford Gas Light Company. Here the estimated cost of a desired extension of mains was $3,000 and the estimated annual revenue, $220 to $285. The petitioners wanted gas for cooking and claimed that the district in question would be developed by the proposed construction. The commission declared that the company might in normal times be subjected to an order of construction, but that now only extensions absolutely necessary in the opinion of the federal authorities should be ordered. Future development of communities is an insufficient reason to order extensions at this time. After the war the situation would probably be regarded differently.

In Massachusetts the commission refused to order the Bay State Street Railway to build a thirty-five-thousand-dollar extension parallel to two lines about a mile apart. The existing service meets the need sufficiently, the commission holds.

COMMISSION'S DECISION IN INDIANAPOLIS RATE CASES

War-Time Relief Falls Chiefly on Power Customers, Domestic Customers' Rates Remaining Almost Undisturbed

The order of the Indiana Public Service Commission entered on Aug. 6 and giving war-time relief to the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company was referred to in the columns of the ELECTRICAL WORLD on Aug. 10. The complete order of the commission has since come to hand with its details. The evidence of the Merchants' Heat & Light Company showed a deficit of $238,793.66 for the year ended June 30, 1918, after including bond interest, interest on unfunded obligations and allowance for depreciation, but no return on investment.

A significant feature of the evidence was the showing of large increases in cost of operation in May and June, the deficit for the first ten months being $8,281.68 and for the last two months $16,069.08, this deficit not including any part of the company's allowance for depreciation. According to its best estimates of earnings and operating expenses for the year beginning July 1, 1918, the Merchants' Heat & Light Company's deficit will be $677,643, based on original schedules and not including any surcharges.

The testimony and exhibits of the Indianapolis Light & Heat Company indicate a net operating deficit for the year ending June 30, 1919, of $173,311.94, or a total deficit of $402,471.94, after adding interest on funded obligations, funded debt, bond discount and miscellaneous charges. This deficit does not, however, include additions to revenue from surcharges.

STEAM-HEATING SERVICE LOSSES

The testimony revealed that the heavy deficits were caused in considerable part by the steam and hot-water heating services, the Merchants' Heat & Light Company showing that its operating expenses and taxes exceeded its revenues by $50,848.95 and the Indianapolis Light & Heat Company showing a deficit of $44,743.38. From the evidence submitted, coal was shown to have increased more than 100 per cent in cost over the year 1915, and approximately 75 cents a ton over the average for the year ended June 30, 1918.

Coal costs in generating electricity in 1915 were 3.4 mills per kilowatt-hour for the Merchants' Heat & Light Company and 3.15 mills for the Indianapolis Light & Heat Company. The coal costs for the year ended June 30, 1918 were 5.7 mills per kilowatt-hour for the Merchants' company and 4.2 mills for the Indianapolis company. The estimates for the fiscal year ended June 30, 1919, are 7.08 mills for the former and 5.74 mills for the latter.

The evidence also shows additional item of expense resulting from the necessity of keeping a large force of guards on duty to protect the power plants from damage.

The testimony indicates that the cost per kilowatt-hour for labor and materials (other than coal) used at the generating plants was 2.65 mills for the Merchants' Heat & Light Company in the year 1918 and 3.32 mills for the Indianapolis Light & Heat Company, and that these costs under the new conditions affecting labor will be raised to 3.18 mills and 4.07 mills for the year ending June 30, 1918. The bare production costs at the switchboard for the year ending June 30, 1918, were 8.35 mills for the Merchants' Heat & Light Company and 7.74 mills for the Indianapolis Light & Heat Company. Indications are that the increased cost of coal, labor and materials will raise these to 1.18 cents and 9.87 mills for the respective companies, to which must be added increased freight rates on coal for the year ending June 30, 1918, making the switchboard costs approximately 1.2 cents for the Merchants' Heat & Light Company and 1 cent for the Indianapolis Light & Heat Company.

Commenting on what might be called "the real public utility business," the service to homes and offices, the commission gives its reasons for not increasing the 7-cent primary rate. First and foremost is the reason that primarily public utilities are organized to serve, not great power-consuming industries, but the people, who, generally speaking, come under the so-called 7-cent rate. Although the cost of reading numerous meters of these consumers—there are approximately 45,000 of them—and other expenses attaching to this business constitute an expense per kilowatt-hour that is out of all proportion to the cost per kilowatt-hour of serving the large power users, there is no evidence in the record or revealed by investigation that the company's losses are attributable to what may be called the 7-cent rate business, or the residence and small consumers' rate.

Acting on the appeals from Dr. Garfield, the Federal Fuel Administrator, that electrical utilities promote economies of electrical energy consumption, the commission refused to increase the minimum charge from 50 cents a month to $1 a month. On the other hand, the so-called secondary charge was raised from 5 cents to 6 cents per kilowatt-hour for all energy consumed in excess of that used over the primary 7-cent rate.

An analysis made by the commission reveals that consumers served at a wholesale rate have been a constant source of loss. Under the original rates energy was sold to companies at 0.0057 cent, or a little less than 6 mills. The 5 mills surcharge applied to all power rates raised this rate to 1.06 cents. The commission fixed 1.65 cents per kilowatt-hour as a net minimum, no matter on what basis the charge is made below which no electrical energy shall be sold. It also increased the surcharges from 5 mills to 7 mills per kilowatt-hour, with the exception that for municipal lighting the 5 mills surcharge is undisturbed.

Indianapolis is one of the country's ammunition centers, and the public utilities move as much probably as 90 per cent of the wheels of the industry. To permit such service to become crippled or inadequate would strike both at the war effectiveness of the nation and the life of the community. The commission expresses itself as not so much concerned with the prosperity of the companies as it is in the maintenance of credit which will permit them to command funds, and while the surcharges may fall short of providing for a return on investment such as would be received in normal times, the central stations must carry their part of the burden of war. All their patrons are under the heavy obligations of winning the war, and the companies themselves are not to be freed of carrying the natural obligations of sacrifice. As a basis for saving coal, the commission urged a pooling of the competitive systems.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Interference of Telephone Line with High-Tension Transmission Line.—In a case affecting the McFaddin Telephone Company the Virginia State Corporation Commission says: "Interference with existing grounded telephone circuits by high-power transmission lines will necessarily become an increasing problem as time goes by and as electric power continues to be developed. It is highly desirable for the good of the whole community that power companies be encouraged, with due regard always to the existing prior rights of the telephone enterprises. This commission expects to pursue a policy accordingly, and will require as occasion may arise such construction of telephone lines as will enable power companies to exist and operate without being forced to bear excessive financial burdens. It will be a matter for determination in each individual case as to that part of the expense of changes from grounded to metallic lines to be borne by power companies. Under such circumstances the commission is of opinion that in this instance the McFaddin Telephone Company should be required to construct a metallic circuit between the towns of Lebanon and Honaker. The amount to be paid by the Appalachian Power Company or the Lebanon Light Company to the McFaddin Telephone Company in this instance has been agreed upon between the parties."

War Rate Surcharge in Arizona.—Acting upon a petition of the Arizona Gas, Electric Light & Power Association, the Arizona Corporation Commission has ordered "that any gas corporation or electric corporation, as defined by the laws of this state, may make application to this commission for permission to make effective a surcharge—*i.e.*, a percentage of the totals of customers' accounts to be added to such accounts—accompanied by data hereinafter to be defined. The company shall file a copy of its application for surcharge at its office in such a manner that it may be inspected by the public. If no formal protest against the proposed surcharge is received by the commission within ten days from the date of filing of said surcharge, the commission will enter an order without further proceedings, denying or granting in whole or in part the surcharge applied for. In the event that a formal objection or protest is received, such objection or protest will act as a stay until opportunity has been afforded protestant to appear at a public hearing in the matter. It is ordered that each application for permission to make effective a surcharge must show definitely the amount of surcharge desired by applicant and to what accounts it is to apply. If any class of consumers is to be exempt from the application of the surcharge, such must be stated in the application and the reasons for the exemption. Accompanying each application there must be filed, under oath, 'statements regarding income, fuel oil, pay roll and additions to property and plant account.' The corporations concerned in these proceedings," the commission says, "have purchased fuel oil for many years under contracts carrying a price of from $1.35 a barrel to $1.60, depending upon the location and size of the plant and upon the grade of fuel. As these contracts are terminated it becomes necessary for the companies to purchase their fuel in the open market at prices ranging from $2.20 upward and with no assurance that the prices will not continue to increase. Labor, particularly that applied to operation and construction, costs from 10 per cent to 25 per cent more than it did a year ago and is also likely to advance still more. Increases in the costs of materials used in operation and of the many other miscellaneous items necessary in the operation of a gas or electric plant all contribute in some degree in the general burden."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Oregon Association of Electrical Contractors and Dealers.—Secretary-treasurer J. W. Oberender, 302 Dekum Building, Portland, Ore., reports that the annual meeting of the Oregon Association of Electrical Contractors and Dealers will be held Sept. 12, 13 and 14 in Portland.

A. S. M. E., San Francisco Section.—The new executive committee of the San Francisco Section of the A. S. M. E. has met and outlined a program for the season. Elgin Stoddard of Charles B. Moore & Company will present a paper on fuel conservation at the first meeting of the year, which will be held Sept. 26 at the San Francisco Engineers' Club.

Meetings and Papers of the A. I. E. E.—Arrangements made by the meetings and papers committee of the American Institute of Electrical Engineers were approved by the board for Institute meetings to be held in Philadelphia Oct. 11 and 12, 1918, and in Toronto on Nov. 22, 1918. The programs of these meetings will be given at a later date.

National Safety Council.—The annual meeting of the National Safety Council will be held in St. Louis, Mo., on Sept. 16 to 20 inclusive at the Statler Hotel. A small safety educational exhibit will be shown in the hotel.

Portland Engineers Hold Joint Meeting.—At a joint meeting of the local engineering bodies of Portland, Ore., Alfred B. Flinn, secretary of the Engineering Council, was the guest of the evening and the chief speaker.

Joint Meeting A. I. & S. E. E. and A. I. E. E.—The electric welding committee of the Emergency Fleet Corporation will hold a joint session with the Philadelphia Section of the Association of Iron and Steel Electrical Engineers and the American Institute of Electrical Engineers and the Engineers' Club of Philadelphia at the Bellevue-Stratford Hotel, Philadelphia, on Sept. 16 at 8 p. m. The very important and timely subject of "Electric Welding in New Industries" will be discussed at this meeting.

N. E. L. A., New England Section.—The program of the annual convention of the New England Section of the National Electric Light Association, to be held in Springfield, Mass., Sept. 27-28 as previously announced in the ELECTRICAL WORLD, will be devoted to problems in the electrical industry due to the war and the utilization of all resources toward winning the war. Some of the subjects to be discussed are outlined tentatively as "Trade Acceptances," by a representative of the Federal Reserve Bank; "Finances," "Financing of Extensions," "Line Extensions in War Time," "Raising of Rates and Coal Clauses," "Interesting Your Customers in the Securities of Your Company and as Stockholders," "War Finance Corporation," by a representative of the Federal Reserve Bank; "Female Employment in Utilities Service," "Wholesale Power—How It Is Being Handled," "Interconnection and Power Requirements," etc. The coal situation will be discussed by a representative of the Fuel Administration of Washington. Other important problems to be discussed are "Increase in Wages, Bonuses, Etc.," "Standardization of Transformer Ratings," "Making Quantity and Service the Basis for Price," by John J. Gibson; "Obtaining Power from Steam Used in Bleacheries," and "Effect of Daylight Saving on Central-Station Incomes." W. L. Goodwin will give a talk on "Coöperation Between Different Branches of the Industry," and a discussion on "Stimulating Appliance Sales" will be held. On Saturday, the last day of the convention, officers will be elected. In connection with this meeting the convention bureau of the Springfield Chamber of Commerce has issued a street guide showing hotels and important places in that city, the traffic rules and regulations, rates at the various hotels and express-train schedules from Springfield. Garages are also listed

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Conservation Committee in Illinois County.—Louis Erskine, Fuel Administrator of Lake County, Ill., has named a conservation committee to look into the conservation of power and light. This committee will have authority to refuse either power or light to a store or industry when it is felt that the use of such power and light is not the best conservation.

United States Circuit Court Refuses to Halt Federal Trade Commission.—The United States Circuit Court of Appeals for the Second Circuit, sitting in New York City, has refused to interfere with the taking of testimony by the Federal Trade Commission against the Nulomoline Company, manufacturing and selling a sugar-syrup product. Contention was made that under the Federal Trade Commission act the commission has no authority to pass upon the validity of a patent, and that under the act the Circuit Court of Appeals may prevent the commission from taking testimony touching the validity of a patent. The court held, however, that the act gives it no power to prevent the commission from ordering that such testimony be taken, as it is not an order to cease and desist from unfair methods of competition, the authority to review which is given to the court by the act.

Tax Payment Settlement in Indianapolis.—The Merchants' Heat & Light Company and the city of Indianapolis have reached an agreement whereby the company will pay to the city one-half of the annual street-lighting contract tax and the city will pay the company for service given to the city since January, minus the surcharges asked by the company. The city has been holding up payments to the company because the company had not paid its contract tax of 5 per cent of the gross revenue from the street-lighting contract. These payments to the company will aggregate approximately $20,000, and the company's payments to the city will be between $4,000 and $5,000. The city contends that it is not liable to pay the surcharges which the company demands. The question of whether the company will pay its regular franchise tax is not involved in this settlement. After surrendering its franchise to the Indiana Public Service Commission, the Merchants' Heat & Light Company, as did the Indianapolis Light & Heat Company, contended that it was no longer required to pay the franchise tax, as it is now operating under an indeterminate permit from the Indiana Public Service Commission.

Rate Increase Sought by Bronx Company.—The Bronx Gas & Electric Company, which operates in Bronx Borough, has filed with the New York Public Service Commission, First District, a schedule showing a proposed increase in its electric rates from 10 to 12 cents per kilowatt-hour, with a minimum charge of $1 per month. The commission has taken no action on the company's request to put this increased charge into effect on six days' notice. The electric rates of this company were under investigation by the commission several months ago, when consumers appeared to request that the commission make no reduction in the rate for fear that the loss of revenue would prevent the company from making much-needed extensions to its transmission lines.

Rate Contest in Paris, Ky.—At Paris, Ky., a contest is in progress between the city and the Paris Gas & Electric Company. The city objected to a proposed raise in rates and refused to pay its lighting bills and the company cut off the supply. An injunction was secured by the city. The company in turn got an injunction against the city to keep it from interfering with the collection of accounts. The council then passed a resolution declaring that the franchise under which the company operates was created for the purpose of producing, distributing and selling electrical energy in Paris, and that the franchise required that the purchaser thereof should install in Paris an up-to-date plant for the purpose of producing and supplying such energy. It declared further that the company had failed and refused to comply with the conditions in that it had not produced energy in Paris. The resolution called upon the company to produce its energy in Paris. The company has been getting its power from Lexington.

Examination of Costs of Bituminous Coal Production.—Coincident with the first anniversary of Dr. H. A. Garfield's incumbency of the position of United State Fuel Administrator an order was signed by him that marks the last stage of an examination into the cost of bituminous coal production in the various coal fields of the United States. The general result as far as the cost to the public is concerned has not been materially altered, as the increases of price allowed to some mines are fully offset by decreases in other mine prices. Comparisons with former prices are not possible on account of the new classifications being entirely different from those which were heretofore in effect. Having now determined the various classifications and general basic cost of the production of coal, it will be a comparatively simple matter to tabulate and adjust the variations of the cost of production from month to month, and it will be possible to keep before the Fuel Administrator tabulations of figures showing how varying labor conditions, cost of mining, material and car service will operate to affect the cost of production.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

By-passing Meter Larceny.—A water consumer who, by false connections, caries water around his meter and consumes it on his property, without the consent of the owner and without having it registered, and with intention thus to deprive the owner thereof without payment therefor, is held guilty of larceny, in the Oklahoma case of Clark vs. State (170 P. 275), which is accompanied (L.R.A. 1918 C. 577) by a notation on the subject of water, gas and electricity as subjects of larceny.

Scope of Employment.—A troubleman of an electric company who is furnished by his employer with a motorcycle for use in his work is held, in Keck vs. Louisville Gas & Electric Company (179 Ky. 314,200 S. W. 452), not to be acting within the scope of his employment, so as to render the master liable for the negligent operation of the machine, while riding to his home after the expiration of his working hours, although the master permits him to use the machine for that purpose. The responsibility of the owner of a motorcycle for its negligent operation by another is treated in a note that is appended to the foregoing decision (L.R.A. 1918 C. 654).

Validity of Commission's Decision.—The public utilities act providing that any party interested in an order or decision made by the Railroad Commission may petition for rehearing, and that, if such rehearing is denied, application may be made to the Supreme Court for writ of review to have the lawfulness of the order of decision determined, are valid limitations on the powers of the courts of the state according to the Supreme Court of California (173 P. 473). Where, at the time the Railroad Commission's decision was made valuing property sought to be condemned, Constitution, Article 12, 23a, had validated legislation vesting the commission with such authority, the fact that the finding was based on a proceeding instituted and testimony heard before the constitutional amendment had become valid and effective was a matter going only to the regularity and propriety of the procedure leading to the finding, rather than to the fundamental jurisdiction of the commission to make the finding itself; and defendant, by failing to ask the commission for rehearing pursuant to public utilities act, or to apply to the Supreme Court for writ of review pursuant to Section 67, waived any objection, and permitted the commission's decision to become final.

W. A. Keating has resigned his position as superintendent of underground lines of the Duquesne Light Company of Pittsburgh, Pa.

Major C. B. Wilcox, chairman of the board of directors of the Sandusky Gas & Electric Company, Sandusky, Ohio, has been appointed director of publicity for Erie County, in connection with the drive for the fourth Liberty loan.

Ira W. Fiske, who has been a member of the electrical engineering faculty of the University of Illinois for several years, has resigned that position to become head of the electrical engineering department in the Drexel Institute of Technology, Philadelphia, Pa.

S. F. Bond, Binghamton, N. Y., electrical engineer for the Binghamton Light, Heat & Power Company, has resigned. W. B. Coudy, formerly superintendent at the plant of the New Kensington Light & Power Company, New Kensington, Pa., succeeds Mr. Bond.

Ross B. Mateer, formerly industrial engineer for the Southern Sierras Power Company with headquarters at Riverside, Cal., and more recently connected with the Philadelphia Electric Company, has been commissioned a captain in the Engineer Reserve Officers' Corps and is at present stationed at Camp Lee, Petersburg, Va.

Harry B. Joyce, who has been connected with the United Electric Light & Power Company for several years as power engineer, has received a commission as captain in the Quartermasters' Corps, U. S. A. Mr. Joyce's experience in practically every phase of engineering connected with electric lighting, and his special knowledge of refrigeration are responsible for his appointment to this important position. He will be stationed at Washington.

Capt. James P. Growdon, formerly superintendent of electrical distribution for the Northwest Electric Company, Portland, Ore., and now with the Fourth Engineers, National Army, according to reports received in Portland, was in the contingent that recently crossed the Vesle River under heavy German fire and felled trees across the stream for the construction of a passageway in advance of the bridge gang. Captain Growdon attended the civilian training camp at American Lake in 1916 and entered the first officers' training camp at San Francisco.

D. C. Black has been appointed superintendent of underground lines of the Duquesne Light Company of Pittsburgh, Pa., to take the place of W. A. Keating, who has just resigned. Mr. Black entered the employment of this company in April, 1913, serving in the underground cable division in the office of the superintendent of distribution until Jan. 1, 1917, at which time he became assistant superintendent of underground lines. Previous to this he worked for the Fulton County Gas & Electric Company, Gloversville, N. Y., and for the United Gas Improvement Company, Philadelphia.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

Leo W. Hall has resigned his position with the Kentucky Utilities Company at Shelbyville, Ky., and has gone to Cape Girardeau, Mo., as district manager of the plant in that city.

W. J. Grambs, formerly assistant to the president of the Puget Sound Traction, Light & Power Company, Seattle, Wash., was recently appointed supervisor of the Sea Training Bureau of the United States Shipping Board for the Pacific Northwest. Mr. Grambs entered government service on Sept. 1, 1917, since which time he has been in charge of the navigation schools of the government in Seattle, Portland, Tacoma and Bellingham and the marine engineering school at the University of Washington.

W. J. GRAMBS

C. W. Ward, superintendent of laboratory, Duquesne Light Company, Pittsburgh, Pa., has been appointed superintendent of light and power of the Citizens' Light & Power Company of Oil City and Franklin, Pa. Mr. Ward entered the electrical industry about sixteen years ago in contracting and central-station work. He has been employed by the Duquesne Light Company for the past seven and a half years, during which time he also taught electric wiring at night at the Carnegie Institute of Technology. At one time he was president of the Duquesne Light Company N. E. L. A. section. In 1912 he was chairman of the lamp committee of the Pennsylvania Electric Association. An intensive study of rubber gloves has been made by Mr. Ward, and he designed the gloves now being manufactured by the Pittsburgh Glove Manufacturing Company.

Obituary

Eugene P. Rowell, treasurer and manager of the Plymouth (Mass.) Electric Light Company, died recently at the Jordan Hospital, Plymouth. Mr. Rowell was about sixty-one years of age and was closely associated with C. D. Parker & Company, Boston, Mass., in the management of central-station properties in southeastern Massachusetts, being a director and officer in several of the Parker companies. He was regarded as one of the best local managers in this syndicate, and had been the executive head of the Plymouth company for many years. Mr. Rowell was deservedly popular in the New England Section of the National Electric Light Association, where he had a host of friends, and was regarded as one of the most "solid" and dependable members. Although operating a small-town central-station, he was responsive to the latest advances in engineering and commercial practice and did much to promote interconnection of lines in the Cape Cod district and the tying of his own system into the large New Bedford plant through a pioneer cross-country transmission.

George William Dickie, naval architect and marine engineer, associated with engineering and shipbuilding on the Pacific Coast for nearly fifty years, died suddenly at his home in Oakland, Cal., Aug. 17, 1918, at the age of seventy-four years. Mr. Dickie was a native of Arboath, Scotland, coming to the United States in 1869 and going to San Francisco. In 1870 Mr. Dickie erected a gas plant at North Beach for the newly organized Pacific Gas Company. This plant, owned by the Pacific Gas & Electric Company, is still in operation. Shortly afterward Mr. Dickie designed the first successful triple-expansion engine built in the United States, and a few years later he designed the first Scotch marine boiler on the Pacific Coast. He became general manager of the Union Iron Works in 1883, a position he held until 1905, when the plant was purchased by the Schwab interests. During that period he designed many privately owned ships as well as a large number of government vessels. The best known of these are the old battleships Oregon, Wisconsin and Ohio and the cruiser Olympia, which became Admiral Dewey's flagship. Mr. Dickie retired from active work about four years ago, but following this country's entry into the war he offered his services to the government and at the time of his death held the position of resident inspector for the United States Shipping Board at the Moore shipbuilding plant in Oakland. Mr. Dickie was a member of the Technical Society of the Pacific Coast, the American Society of Naval Architects and Marine Engineers and the American Society of Mechanical Engineers. He was also chairman of the machinery group of jurors at the International Panama Pacific Exposition.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

COPPER MARKET FOLLOWING THE AFTER-WAR DEPRESSION

Metal Promises Strong Recovery on Account of Increased Demand—Price Will Be Determined by Market After a Readjustment

The future expansion of telephone and telegraph lines, street railway work and the proposed construction of railroads will have considerable bearing upon the copper market directly after the depression that will probably follow the declaration of peace, according to authorities on copper conditions. Telephone and telegraph lines have been curtailed to the barest necessities. A cable company is planning a line to South America which will require several thousand miles of copper cable, the manufacture of which will require more than a year after the work is begun. Electrical machinery manufacturers are limited in their operations because sufficient copper is not obtainable at present. The war has caused the postponement of many other undertakings that will use all of the copper that can be produced.

It is not thought that the movement in copper-consuming industries to catch up with the position vacated when the mills entered on war production alone will necessarily begin with the quotation at the 26-cent level for copper and work forward as the demand expands. On the contrary, producers of the metal hold that in many cases with the cessation of hostilities there will come a period when industry rather generally will pause to establish a new basis for going ahead. The gradual concentration of American mills upon the production of war materials naturally shelved domestic commercial consumption of the metal until at the present time—after a period of a few months more than one year in which this country has been a belligerent—it is estimated that between 90 and 95 per cent of all the copper coming from the refineries is being used in war manufacture, either directly or indirectly.

The copper industry is at present beset with high costs, inadequate supply of labor, with steadily advancing wages, insufficient transportation, especially by sea, and a demand for war purposes which has thrust into the background most lines of manufacturing for purely commercial sales. That every pound of production will be needed, and more too, if certain of the less essential industries are to be supplied with a part of their normal quota, is the prediction made by men engaged in the distribution of the metal to manufacturers. Consumption in the war plants is growing daily, and the pressure for copper which comes upon the copper producers' committee from other consumers has been especially insistent since the price was fixed a few days ago to run to Nov. 1.

The National Conduit & Cable Company recently estimated that the domestic demand this year would require 1,500,000,000 lb., while the allied nations of Europe were depending on us for 1,250,000,000 lb. This would mean that 250,000,000 lb. will either have to be taken from stocks—which are meager—or produced by forced production or that consumers somewhere must be curtailed before the end of the year even below their present allotments. What may be deduced from these figures is that the mining companies will be able to sell every pound of their output in 1918, as this output may now be estimated. In spite of abnormal costs, the fixed quotation of 26 cents is permitting the larger concerns to make an excellent profit.

This curtailment means just a delaying of the needed use of copper, which is bound to come when we have defeated Germany and business as usual returns for the United States and the rest of the world.

ORIGINAL BONUS SYSTEM TO DECREASE LABOR TURNOVER

New England Electrical Manufacturer Pays $2.50 in Installments to Any Employee Bringing in Another Who Stays Six Weeks

To cut down the labor turnover as well as to add new workers to his payroll, a New England electrical manufacturer has successfully adopted a bonus plan along the following lines: When one employee succeeds in inducing a second one to join the factory workers the new arrival is credited to the former's record. At the expiration of two weeks' service the employee bringing in the new one is paid a dollar, a second dollar being given to him at the end of the fourth week of continuous employment. If the newcomer stays six weeks, a final allowance of 50 cents is given. In practice, it generally works out that the employee who brings a second one into the factory shares the bonus with the new member as a mark of appreciation. For each new employee brought in the above bonus plan applies.

WAR BULLETIN ISSUED BY NEW ENGLAND JOBBER

Points Out How War Regulations Affect the Sale of Electric Supplies, Particularly Conduit and Fittings

To assist in the coöperation of the electric trade with the government a bulletin entitled "War-Time Coöperation" has been issued by the Pettingell-Andrews Company, Boston, pointing out how war regulations affect the sale of electrical supplies and of conduit and fittings in particular. The General War Service Committee of the Electrical Manufacturing Industry met in conference with the War Industries Board in June and submitted recommendations regarding preferential listing for steel. It was recognized that a large amount of essential material and supplies can best be distributed through jobbers and dealers, but in so doing it is important to insure the proper conservation of materials and supplies in the hands of these selling agencies.

It is felt that dealers and jobbers should come within the limitations of any pledge taken by individual manufacturers, and that each individual manufacturer should exercise policing power in this respect with the dealers and jobbers. A form of pledge, based on the manufacturers' pledge in accordance with the suggestion of the War Industries Board, is now in process of preparation, and after approval by representatives of the Trade and War Industries Boards, every dealer and jobber will be called upon to sign it.

The bulletin states that, in accordance with the notice from the manufacturers, the company cannot obtain replacements of its stocks of rigid conduit, elbows and couplings from the manufacturers of iron conduit without priority numbers or detailed statements showing for what purpose the stock has been sold, under the governmental classifications. Prior to the issuing of the pledge for jobbers and dealers it became necessary to furnish on all orders for iron conduit priority order numbers obtained from customers. If these cannot be secured in any case,

the order must state the purpose for which conduit is to be used, specifying the classification number as shown in the "Electrical Manufacturers' Pledge," reproduced in the bulletin for the convenience of the trade (see ELECTRICAL WORLD, July 13, page 76). Coöperation along this line is necessary in order to secure prompt service, and any orders received for rigid conduit without the priority or classification numbers will be subject to acceptance based on ability to ship from stock on hand. It appears likely that any rules and regulations which may be formulated by the joint committee with respect to rigid conduit will unquestionably be applied to other lines of electrical material later on. Further bulletins are to be issued as occasion requires.

METAL MARKET SITUATION

Copper Settles Down Following Activity After Price Setting by Government—Tin Still Declining

In so far as the supply of copper is concerned, the War Industries Board seems assured that actual requirements will be met. Refiners are said to have stocks of considerably more than 200,000,000 lb. of crude copper as well as the current production to draw from. These facts are reassuring in the face of the probability of labor shortage at copper mines due to the next draft. If the war is prosecuted vigorously over the next six-month or eight-month period, high military authorities tell us that the war will be over by the end of 1919. Activities of war industries will thus be intensified, which means that less essential industries will be given smaller consideration from the government as time goes on.

Copper is naturally one of the most essential commodities in prosecuting the war, and large amounts are necessary in the manufacture of electrical machinery, which is finding increasing favor with the war industries for saving fuel.

Fewer orders for copper have been placed by domestic consumers in the past week, following the great activity immediately resulting from the settlement of the selling price to govern shipments until Nov. 1. Some consumers, however, have placed contracts for their prospective requirements in November and December at the price established at the next conference between the War Industries Board and representatives of copper producers.

The decline in tin abroad continues, and there is a good deal less of tin in sight unsold than there was a short time ago.

There has been an active demand for spelter in the Middle West, with improving prices throughout the week. The price of zinc ore has advanced and production has fallen off.

President Wilson has approved the order continuing the base price of aluminum—$33 per lb. f.o.b. producing plants for ingots 98-99 per cent pure—from Sept. 1 to March 1, 1919. The trade was expecting a further increase to stimulate production.

NEW YORK METAL MARKET PRICES

	Aug. 21	Aug. 27
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	29.25	29.25
Lead, trust price	8.05	8.05
Antimony	14.25 to 14.37½	14.37½
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	Govt. price 15.00	Govt. price 15.00
Spelter, spot	9.35 to 9.47½	9.50 to 9.75
Tin, Chinese *	90.00	81.00 to 83.50
Aluminum, 98 to 99 per cent	Govt. price †33.00	Govt. price †33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.50	23.50 to 24.50
Brass, heavy	14.50 to 15.00	14.50 to 15.00
Brass, light	11.50 to 12.25	11.50 to 12.25
Lead, heavy	7.50 to 7.75	7.50 to 7.75
Zinc, old scrap	6.35 to 6.50	6.75 to 7.00

* No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb.; 1-ton to 14-ton lots, 33.20 cents per lb.

THE WEEK
IN TRADE

BUSINESS has been steady this week on account of the increased amount of government construction. The ruling of the War Industries Board declaring jobbers of electrical goods essential has brought about a feeling of relief and satisfaction on the part of the jobbers. Material is still hard to obtain, but this condition is bound to continue for the duration of the war.

The labor situation in all quarters is reported to be acute, and not a little anxiety is being experienced over the future supply of help. However, the employment of women, which seems inevitable in a great majority of places, promises to replace men called in the draft. All contracting work is being shifted to wiring industrial war plants and homes for workmen in shipbuilding and other productive industries, no rewiring being attempted by contractors. The Middle Western territory reports a lack of activity on account of almost absolute cessation of all building. Some appliance selling is mentioned.

The shortage in power, especially in the East and Southeast, has, from all indications, a tendency to depress the market. Increase in rates at Atlanta is hoped to relieve the situation somewhat, but the curtailing and actual cutting off of the power supply is certain to deaden the market. Rainfall in this region, however, will relieve the situation, but otherwise there can be no help.

NEW YORK

The fact that the order recently issued by the War Industries Board declaring electrical jobbers essential and laying down certain rules to be followed as universal has tended to stabilize the industry and indicate to the consumer that the jobber is doing the best he can when he refuses to sell material for non-essential uses. At present, however, the jobbers have not sufficiently learned all of the rules formulated by the Priorities Commission so that they are trying to find themselves in order to abide closely by them. Some customers become angry on not being able to purchase material and supplies, but are mollified when they find that all jobbers will treat them alike.

It is thought that the embargo on selling material for non-productive purposes will not weaken the demand for electrical goods for the duration of the war because of the unprecedented demands placed upon them by essential industries. All products that contain steel or brass are extremely hard to obtain at present. The scarcity of this material is shown in the order of the Industries Board to limit the production of washing machines and to stop the manufacture of curling irons, coffee percolators and chafing dishes. Aluminum is also somewhat scarce and hollow-ware utensils are likely to be prohibited if less essential.

ARMORED CABLE.—This material cannot be obtained by the dealer from the jobber except on a government order, and one concern has discontinued its manufacture.

ELECTRIC IRONS.—Despite the fact that the future production of electric irons is not certain, they are moving fast. One jobber states that the fall trade has started with a rush. The majority of jobbers have a supply of these devices on hand and can therefore supply the demand.

VACUUM CLEANERS.—The scarcity in household help is thought to be the cause of the demand for vacuum cleaners. Jobbers report the trade to be brisk, and many are able to supply the demand

WASHING MACHINES.—The demand for washing machines this week was not very great, but it is expected to pick up this fall. Washing-machine manufacturers will be

allowed to produce 75 per cent of last year's output and are thus assured of keeping their product in the market.

MOTORS.—Some jobbers state that they will not sell motors except on government orders. As a matter of fact, however, motors are very scarce and there is considerable difficulty in meeting the demand even for government requirements.

FLOODLAMPS.—On account of the increased demand for floodlamps and the scarcity of material, an increase has been noted of about $1.75 apiece on units ranging from $17 to $75. The devices are being used very extensively in shipyards for protective lighting and for illumination for night work.

FITTINGS.—Government demand for fittings is maintaining an active market for this material. Jobbers report being well able to supply the demand.

LIGHTING UNITS.—In contemplation of large demands for lighting units for industrial plants, dealers are beginning to stock up. Especially important is the fact that the elimination of the daylight-saving regulation on Oct. 1, when clocks will be set back one hour, will greatly help this class of business.

CHICAGO

The last week has been an unusually quiet one for the Chicago territory, but a few features of the appliance market may be noted as follows:

BATTERIES.—There is a big market already established to replace worn-out farm-lighting battery cells. Several manufacturers in this branch of the farm-lighting business report large increases in orders.

INSULATING COMPOUNDS.—Deliveries in large lots on insulating compounds, tapes, etc., are from six weeks to two months, which is considered fair at present.

ORNAMENTAL LIGHTING FIXTURES.—Several manufacturers of lighting fixtures are now handling government contracts on machine work, having given up the fixture work during the war.

GRAPHIC METERS.—Industrial plants and central stations are realizing the benefits derived from using graphic meters for checking production, etc., and are buying many meters. Deliveries are good. Several new types of instruments will be announced shortly. One ship has recently been equipped with fourteen graphic meters.

INDUSTRIAL LIGHTING EQUIPMENT.—One prominent Middle West manufacturer has recently received a government order for 20,000 lighting standards for use in camps, etc. Large orders have also been placed by lighting equipment for shipbuilding plants. Deliveries outside of government orders are fair considering the amount of orders being filled.

PROTECTIVE DEVICES.—Several manufacturers report that orders for this type of equipment for central stations and government plants are coming in stronger than for the last three months. Deliveries good.

BOSTON

The volume of trade continues heavy along industrial lines, and the government absorption of stock and supplies is maintained at recent high levels. Collections are a little slower, and it is expected that not much change will be seen until after the next Liberty loan campaign. Transportation conditions are no more favorable, the railroads being literally swamped with traffic. Despite the sharp advances in passenger rates, trains are still well filled. Central stations are struggling to meet their power requirements, and very little solicitation of new business is to be seen. Prices are holding firm, and some observers would not be surprised to see further advances this fall. The retail trade is considerably exercised at present over the question of essential versus non-essential products. Jobbers' stocks are fairly large, on the whole, thanks to far-sighted purchasing. The labor shortage, already acute, bids fair to become still more so with the passage of the draft bill. All branches of the trade are affected by the nation's call for men. A serious attempt to utilize women on a far larger scale seems inevitable.

WASHING MACHINES.—The demand for these convenient equipments holds up so well that some dealers are beginning to wonder where they are going to obtain enough outfits to fill their fall orders. The present year will go down in electrical sales history as a remarkable one in connection with the popularizing of motor-driven washers. Prices are firm, and if railroad deliveries were better the jobbers would appreciate it, to say nothing of the retailers.

ELECTRIC RADIATORS.—Good sales of these are reported for summer camp and cottage service. Fuel Administrator Storrow of New England has issued a statement to the effect that the Boston ruling against using domestic heating coal prior to Dec. 1 was not authorized by him. Strict economy will be required, however, and in the middle fall days the use of radiators at morning and night will unquestionably be the means of extensive retail sales.

LAMPS.—Most of the factories are beginning to accumulate stocks of the more common sizes, though no excess in reserve is to be seen beyond what is desirable to meet the demand of the coming winter months; in fact, if production stopped now for commercial lamp sales, some manufacturers would soon be exhausted. Others who have gone into the matter of providing enlarged plant facilities on an immense scale have now reaped the benefit of their outlay in the establishment of a stock sufficient to meet all commercial demands of 1918 if not to go through the business of the early spring. The supply of an adequate volume of bulb glass of requisite quality is troubling some of the lamp makers.

VACUUM CLEANERS.—The approaching close of the vacation season and return of the prospective purchasers to the city or town home means that the early fall business in cleaners should take a turn for the better. The demand for these equipments has lately been rather quiet, and except where manufacturers have been concentrating their efforts on special war work there should be no shortage anticipated. Retailers have been featuring cleaners this summer in all parts of New England, but no overselling has been reported as in the vacuum-cleaner field.

IRONS.—The selection of irons is somewhat limited by a shortage in one or two of the best-advertised makes. Recent price advances have had little effect on total sales, so far as can be seen. Stocks are still fairly large, and the time apparently has not yet arrived where the buyer must be refused if he or she does not insist upon a specified make.

FIXTURES.—The fixture trade is relatively quiet, but it is not dead, as some people in the trade intimate. In the last fortnight one Connecticut jobber sold about $200 worth of fixtures—a small turnover compared with normal times, to be sure, but none the less worth handling. Manufacturers of portable lamp standards are busy on munitions work, and the makers of reflectors are occupied in like manner with government orders.

MOTORS.—The situation seems to grow better and better as regards the supply of motors of small and moderate size.

SWITCHES AND SOCKETS.—The shipping program and industrial plants are absorbing these products in great quantity. Labor, while none too plentiful, seems to be working more steadily than in some lines. The possibility of the government's forcing the manufacturers to reduce the variety of their designs is causing some anxiety. Little is heard about price changes.

DRY CELLS AND FLASHLAMPS.—For the moment the supply seems to be increasing, and the demand is being met well.

STORAGE BATTERIES.—The demand on the manufacturers is enormous, especially for batteries of the alkaline type. Too much insistence upon type, however, is sometimes the cause of delays in filling industrial truck orders. Deliveries on batteries vary considerably among makers.

ATLANTA

A depressing feature in trade is reflected by the continued drought, which is being keenly felt by many of the water-power companies in the Southeast. The plants in the lower levels have been more fortunate than those in the mountainous districts. Owing to the shortage of rainfall on its drainage area, the Georgia Railway & Power Company cut off its secondary customers several weeks ago and was compelled to discontinue power service to its primary power users beginning Aug. 12, and unless there are immediate rains this program will continue indefinitely.

Governmental construction appears to hold the center of the building stage this week, as evidenced by announcements from Washington that facilities at Camp Gordon, Atlanta, and Camp Jackson, Augusta, will practically be doubled.

In addition to the new artillery camp to be erected at Fayetteville, N. C., all of this construction is to be completed in a short space of time, and there will be a very heavy draft on jobbers for schedule material.

The various fuel administrators covering the Southeastern States have inaugurated "ginless days." Steam-driven and electrically driven gins will be put on the same basis. The effect of this order on the power companies' revenues will be negligible. All cantonments will be equipped immediately with electrically driven laundries.

The Woodward Iron Company, Woodward, Ala., will erect a plant costing $25,000,000, the product to be used principally for the construction of steel ships at the Southeastern shipyards. Steel ships will be constructed by the Brittain Shipbuilding Company of Jacksonville, Fla. This company has a capital of $1,000,000. The Jacksonville Dry Dock & Repair Company of Jacksonville, Fla., has been incorporated for $750,000. It will build and repair ships.

WIRE.—The volume of sales for both weatherproof and rubber-covered wire shows a weekly expansion, and requirements are being taken care of.

DRY BATTERIES.—The call for these has been very good this week, and arriving carload shipments are retagged for reshipment without being unloaded. Shipments seem to be very good and average around fifteen days.

RENEWABLE FUSES.—There is a very active market for refillable fuses, and contractors and dealers are realizing more every day the potentialities of this business.

CONDUIT.—Jobbers have pledged themselves not to sell any conduit or similar fittings to anybody unless orders are accompanied by sufficient information to indicate that these products will be used for essential work. There is a heavy latent demand that cannot be taken care of at this time. Estimates on good authority place Southeastern stocks at 25 to 40 per cent below normal.

SEATTLE—PORTLAND

Northwest jobbers and dealers as a whole report that the volume of business for last week shows a slight increase over the previous week. Shipyard buying continues in steady flow and government orders are materially increasing. The week's business was not featured by big orders. Portland jobbers report that it is anticipated that the new government regulations restricting the sale of electrical material of all kinds to essential industries will cause very little if any disturbance in that district. Seattle jobbers, however, are not nearly as optimistic. In Portland it is estimated that not more than 10 per cent of manufacturers' sales will be affected. Seattle jobbers report that stocks along all lines are nearing depletion.

By speeding up production the lumber manufacturers of Oregon and Washington are preparing to take care of increasing government demand. For the second consecutive week the mills actually cut more than their normal capacity. A large proportion of the cut continues to go into aeroplane stock and ship timbers.

POWER APPARATUS.—No stocks on hand, and the heavy volume of orders is filled as stock is received. Shipments are coming through comparatively well. Government buying has been heavier in the last two weeks, and orders and inquiries from mills and new industries show slight increase.

CONDUIT.—It is just as hard as ever to obtain conduit, and the demand continues heavy. Stocks can be secured only on government order and for government work.

DOMESTIC APPLIANCES.—Washing machines continue to be the leader in appliance sales, although vacuum cleaners, flatirons, ranges, etc., are moving satisfactorily.

LAMPS.—There is no noticeable change in the lamp situation, which is far from satisfactory. The larger sizes are required in heavy volumes by shipyards and are exceptionally hard to obtain. Smaller sizes move fast and are fairly easy to get. Auto lamps show no great demand, which is fortunate as they are also scarce.

LAMP CORD.—Lamp cord is being used for maintenance purposes largely and is coming through in fair shape. However, stocks are rather low.

FLASHLAMPS.—The demand for flashlamps is about the same, but considerable difficulty is encountered in securing the larger sizes.

SAN FRANCISCO

In investigating business conditions among electrical contractors it is found that jobbers in general report that the business from this source of trade holds up surprisingly well, considering that private building is discouraged and will soon be made almost impossible by reason of shortage of necessary material. On the other hand, many contractors in districts not yet listed as sites for necessary building are eagerly acquiring information on large household appliances so as to recoup themselves for loss in other classes of trade. The fine crops and the high prices for them will soon affect interior California in the same way that the distribution of large amounts of spending money by industrial workers in the coast cities and large interior towns has done.

CREDITS AND COLLECTIONS.—Collections are good and the time of payment is being shortened by wholesale houses generally. The retail trade shows an increase both in volume and in value, and collections are good from this source also.

MARINE MATERIAL.—The scores of standardized cargo boats that have been launched during the last few weeks from Pacific Coast shipyards demand an enormous amount of what may be termed marine schedule material, and many coast factories have sprung up to supply a demand with which Eastern factories are unable to cope. Labor Day will witness another wholesale launching. The Bryant Spartan line of marine schedule material has just advanced 15 per cent, and big sales are reported.

FIRE EXTINGUISHERS.—The United States government having commandeered the supply of carbon tetrachloride, which enters largely into the manufacture of fluids for one-quart extinguishers such as the "Pyrene" and the "J. M.," it will soon be impossible for any but favored and essential industries to obtain liquid renewals. There is only a small stock on hand at the factories, but one or two electrical jobbers and the automobile jobbers have fair stocks.

INSULATING MATERIAL.—The inability to secure prompt shipment of motors and the small proportion shipped on orders have created a big demand for repaired motors, and any motor that can be sent back to the firing line is sure of a prompt turnover. Motor repair firms are doing the best business, perhaps, of any class of electrical dealers and contractors. A recent thousand-dollar order for insulating material and motor-repairing material for such a firm is reported in San Francisco. Insulating cloth has recently advanced 10 per cent, and the higher grades of friction and rubber tape from 5 per cent to 20 per cent.

SCHEDULE MATERIAL.—The latest staple to become subject to priority conditions is schedule material, comprising sockets, switches and cut-outs.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List Per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	12½%—57.25
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	12½%—66.75

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	12½%—97.75
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	12½%—126.80

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%
	No. 12 Solid
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00 to $80.00
Coil to 1000 ft	98.80 to 75.00
	No. 12 Solid
Less than coil	+20% to +5%
Coil to 1000 ft	5%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	12%
1/5 to std. pkg	20%
Std. pkg	44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg	25% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35—.36	.35—.36
50 to barrel	.31—.32	.32—.33
Barrel lots	.28—.289	.29—.299

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.319 to .322	.329 to .332
Barrel lots	.289 to .292	.299 to .30

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00— 82.50	$69.75— 75.00
⅜-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00—110.00	93.00—100.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75 to $64.25
⅜-in. double strip	78.25 to $78.75	71.25
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
3/16	$0.05½	1	$0.25
¼	.06	1¼	.33
5/16	.09	1½	.40
⅜	.12	1¾	.47
½	.15	2	.55
¾	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
3/16-in.—	25.00–55.00	24.00–24.45	21.50–23.00
¼-in.—	30.00–60.00	27.00–27.28	23.50–26.00

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
3/16-in.—	$60.00	$30.00	$26.50
¼-in.—	65.00	32.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	.08½
⅜	.08½
½	.11½
¾	.17
1	.23
1¼	.27½
1½	.37½
2	.58½
2½	.76½
3	

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.19
¼	.06	.19
⅜	.07	.19
½	.10	.25
¾	.13	.37
1	.17	.45
1¼	.21	.50
1½	.28	1.10
2	.40	1.80
2½	.60	4.80
3		

DISCOUNT—NEW YORK

	⅛ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 12%	10% to 15%
2500 to 5000 lb.	9% to 14%	12% to 17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	⅛ to ½ In.	¾ to 3 In.
Less than 2500 lb.	1.5% to 6.8%	3.5% to 8.8%
2500 to 5000 lb.	4.5 to 10.7%	6.5% to 12.7%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	30%

CHICAGO

List price	$5.00 to $7.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	30% to 31%
1/5 to std. pkg.	40% to 41%

FUSE PLUGS

3-Amp. to 30-*Amp.*

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.00 to $5.50
1/5 to std. pkg.	4.50 to 4.75

Standard packages, 500. List, each $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$7.00
1/5 to std. pkg.	5.75

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA

105 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.77
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

	List
Less than std. pkg.	
Std. pkg.	10%

DISCOUNT—CHICAGO

	List
Less than std. pkg.	
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.20—$35.90
Coil to 1000 ft.	26.95— 27.18

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$35.00
Coil to 1000 ft.	26.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75 to $30.00

OUTLET BOXES

Nos.	List, Per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	25% to 33%	20% to 27%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Glavanized
Less than $10.00 list	30% to 40%	20% to 35%
$10.00 to $50.00 list	40% to 50%	30% to 45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00 to $38.00
1/5 to std. pkg.	17.85 to 19.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$16.80
1/5 to std. pkg.	15.80

Standard package, 2200. List per 1000, $20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000
Less than 1/5 std. pkg.	$16.00 to $20.50	$32.00
1/5 to std. pkg.	13.60 to 15.60	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000
Less than 1/5 std. pkg.	$11.70 to $24.00	$32.00 to $33.85
1/5 to std. pkg.	10.15 to 20.40	26.60 to 27.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10% to 10%
1/5 to std. pkg.	5% to 8%

DISCOUNT—CHICAGO

	List
Less than 1/5 std. pkg.	
1/5 std. pkg.	16⅔%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+5% to Net
$10 to $25 list	11% to 15%
$25 to $50 list	14% to 20%
	Low Grade
Less than $10 list	5% to 10%
$10 to $25 list	16% to 25%
$15 to $50 list	24% to 28%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+15% to +5%
$10 to $25 list	List to 11%
$25 to $50 list	5% to 14%
	Low Grade
Less than $10 list	+5% to 5%
$10 to $25 list	8% to 16%
$25 to $50 list	16% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	5% to 8%
Std. pkg.	23% to 25%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to 10%
1/5 to std. pkg.	List to 16⅔%
Std. pkg.	25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	40% to net	30% to net
$2.00 to $10.00 list	10% to 50%	5% to 40%
$10.00 to $50.00 list	20% to 60%	10% to 52%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$6.35 to $7.00
Discount	25% to 30%

WIRE, ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.434—$0.4625
No. 18, full spools	.384— .4425

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.69
No. 18, full spools	.55 to .575

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00–$20.00	$12.50–$15.00	$11.00–$11.25
12	21.29– 27.10	19.35– 23.20	17.05– 17.42
10	29.70– 37.80	27.00– 32.40	23.75– 24.30
8	41.90– 53.35	38.10– 45.70	33.45– 34.29
6	60.30– 84.40	54.27– 72.35	51.55– 53.05

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$19.00–$21.00	$16.00	$13.25
12	28.70– 29.46	28.70– 29.46	24.50– 25.54
10	40.10– 41.10	40.10– 41.10	34.23– 34.62
8	56.50– 57.90	48.23– 57.90	41.34– 50.18
6	85.31– 91.18	77.84– 85.31	66.72– 72.27

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$37.75 to $38.40
25 to 50 lb	36.40 to 37.75
50 to 100 lb	32.40 to 36.75

CHICAGO

	Per 100 Lb. Net
Less than 25 lb	$37.00 to $39.72
25 to 50 lb	36.00 to 38.72
50 to 100 lb	35.00 to 37.72

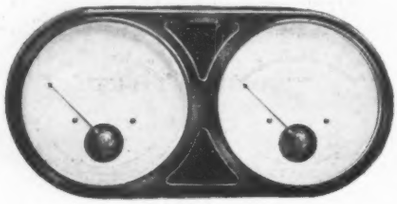
NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Duplex Instruments

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces two duplex instruments for battery-charging, marine, dental, telegraph, telephone, farm-lighting and other compact instrument panels where direct current is involved.

These duplex outfits consist of any two standard Westinghouse type AW or type FW instruments desired,



COMPACT INSTRUMENTS FOR DIRECT-CURRENT USES

mounted in an attractive dull-black metal case. The type AW instruments have round open faces 3 in. (7.6 cm.) in diameter, with glass cover and rear mounting studs; the type FW have 5-in. (12.7-cm.) faces.

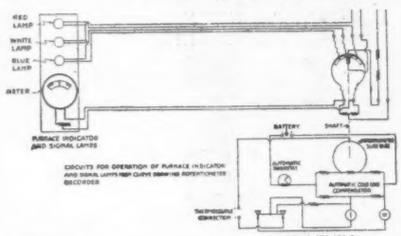
Apparatus for Controlling Furnace Temperatures

In a line of power-driven instruments for controlling, measuring and recording furnace temperatures recently developed by the Leeds & Northrup Company of Philadelphia, all adjustments are made automatically, the galvanometer merely determining in which direction the adjustment is to be made. Early attempts to use a galvanometer for this purpose were along the line of having the boom or pointer of the galvanometer close an electrical circuit. This, however, proved unsatisfactory, because with low voltages on the boom contact would not be made through particles of dust, while with a higher voltage the boom would "freeze" or fuse to the contactor. In the Leeds & Northrup apparatus the boom serves merely as a mechanical trigger.

A reciprocating part kept in constant motion by a motor is arranged so it will not strike the boom when the latter stands in the no-current position, but when the boom moves out of this position in either direction the reciprocating part pushes it against another part. This movement adjusts the bridge or potentiometer circuit, the amount of the adjustment being regulated according to the distance which the boom has swung—that is, to the unbalancing current through the galvanometer.

The power of the motor is sufficient not only for making the adjustments but also for the operation of the chart drum or roll. For this purpose, however, the motor must run at a constant speed—that is, sufficiently constant to give good time-keeping qualities—since the abscissas of the chart are laid off in hours and minutes. This necessitates the use of a special governor of the centrifugal type which opens or closes a shunt in the field circuit.

Central control stations are facilitated by the introduction of base metal thermocouples which permit the prolongation of the couple itself to the measuring instrument, where the effects of temperature upon the cold end of the couple are readily compensated for by the adoption of the potentiometer method of measurement. The central



POTENTIOMETER METHOD OF MEASURING TEMPERATURES

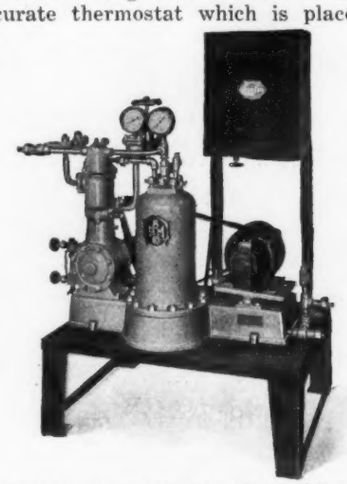
control operator is provided with switches by means of which he can light signal lamps for the guidance of the operators at the furnaces. A multiple-point recorder is generally installed to record the different temperatures automatically, one after the other.

Where it is preferred to have the signaling at the furnace done automatically, a Leeds & Northrup "single-point" or curve-drawing recorder is provided with contacts on the moving element by means of which the signal lamps will be lighted to indicate whether the temperatures in the furnace are too high, too low or correct.

A double recorder sometimes used is suitable for demonstrating uniformity of furnace temperatures or the lack of it. It shows graphically the effects of empty furnace, full furnace or part full furnace, and how distribution of heat is affected by rates of firing, location of load, door and other losses, cold hearth, etc. It is a convenient means for investigating furnaces and showing how errors may be overcome by moving burners, baffles or arches, or changing the method of introducing heat, as by the use of side burners, underfiring, overfiring larger number of burners, position of doors, etc. It also shows definitely the effects of location of thermocouples, how the readings vary according to their placing with respect to the work and the burners, and also the number of couples to be used in a given furnace, etc. This type of equipment has been found of especial value in studying the heating of different kinds and sizes of sections or numbers of pieces, different methods of loading, speed of loading and unloading, mechanical furnacing, the heat treatment of large single pieces, such as gun forgings, etc.

Iceless Electric Refrigerating Machine

An electric refrigerator to be used in connection with any substantial and well-insulated cooling room has been placed upon the market by the Sanitary Refrigerating Machine Company, Milwaukee, Wis. It is claimed that it produces and maintains a uniform temperature for perfect refrigeration regardless of any natural temperature variation. The machine, as shown in the accompanying illustration, has a capacity of ½ ton (453 kg.), or equivalent to an ordinary ice-melting effect in twenty-four hours. It is operated by a ½-hp. motor and is automatically controlled through the medium of an accurate thermostat which is placed in



TEMPERATURE CONTROL WITHIN 2 DEG. BY THERMOSTAT

the refrigerating chamber. The temperature is thus controlled within a range of 2 deg. Fahr.

The machine, including compressors, condenser, motor and automatic control,

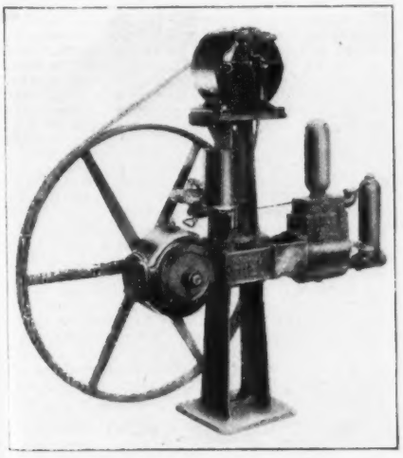
is mounted on one base as shown. The manufacturer claims that there is absolutely no danger in operating this machine because the water is used for condensation and failure of water supply will result only in high pressure in the condenser. Should high pressure be created through water failure or any other reason, the high-pressure gage at the top of the condenser is so constructed that an electrical contact is formed, and this pressure automatically trips the electric contact, turning off the motor, which remains off until the pressure decreases and the machine is started again.

Besides cooling the temperature of the refrigerator, the "Sanitary" machine can also be used for making ice in moderate quantities. For this purpose the brine tank is constructed with an inside compartment with molds of any desirable size.

The machine is especially adaptable for use in retail meat markets, groceries, restaurants, cafés, large residences, dairy product concerns, small harbor vessels, etc.

Automatic Electric House Pump

Small floor space requirements are said to be one of the features of an automatic electric house pump for pneumatic service manufactured by the Hill Pump Company, Anderson, Ind., which is so arranged that it can be mounted on a sub-base adjacent to the tank or at a distance as desired. The pump is of the horizontal double-acting type. It is held to be most successful for drawing water by suction and forcing a continuous stream against pressure. The pump is operated by a Westinghouse motor mounted on the top of the pedestal, as shown, so that it is away from dampness, oil or floor dirt and convenient for starting and



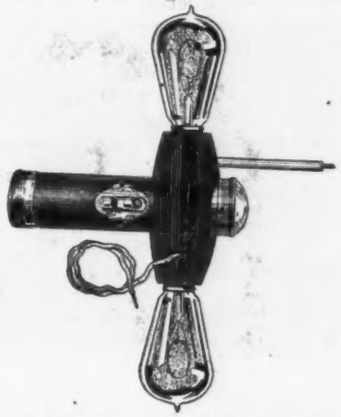
USES BUT SMALL AMOUNT OF FLOOR SPACE

stopping. The water pressure in the system is maintained at a fixed value.

The motor is connected directly to the electric light circuit in the house. The pump forces water into the pneumatic tank, compressing air therein as required. The expansion of the air drives water through the house pipes to the kitchen, laundry, bath, etc., in a continuous stream. When the pressure in the tank reaches the desired maximum the motor and pump automatically stop until the water is drawn off enough to reduce the pressure to a predetermined setting of the switch. To prevent the tank from becoming waterlogged an air valve is provided which, when opened, allows air to be forced into the tank with the water.

Illuminated Fuse Tester

Unless some form of tester is available, it is common practice to replace with new fuses all the fuses of a cut-out box in which one fuse has been blown, waiting for a later opportunity to make a test to detect the blown fuse or fuses. An appliance designed to eliminate this time and money loss has been developed and is now being marketed by R. S. Blake, 230 South La Salle Street, Chicago. This device con-



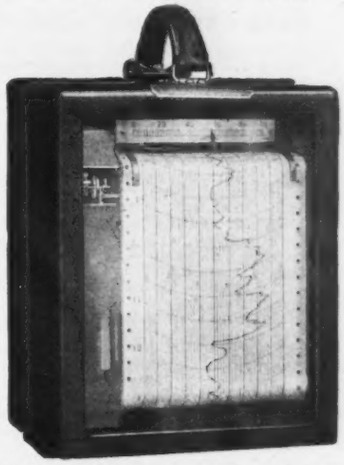
TESTS FUSES REMAINING IN OPERATING POSITION

sists of an instrument to test fuses in their position with safety. The tester is held in one hand, and the light from a dry cell flashlamp illuminates the fuse. The necessary contacts are made by means of the two contact points shown in the illustration, one a stiff heavy-rubber-insulated wire and the other a rubber-insulated flexible wire. The result of the test is immediately apparent by the lighting or remaining dark of the two test lamps in series.

This device makes it possible for one person to test fuses easily. The sockets in the "Blake fuse tester" are standard Edison base, and any standard lamp may be used in them. Any voltage up to 500 may be tested.

Light Portable Graphic Recording Instruments

The Esterline Company, Indianapolis, Ind., announces the model "MS" portable graphic recording instrument in which the weight has been reduced from 23 lb. to 17 lb. (10.4 kg. to 7.7 kg.). This is due to the fact that the case and many parts are made of aluminum. The meter elements are of the dynamometer type and have no pivots or jewels, and the moving element is carried on steel suspension wire. The



ENTIRE METER IS ACCESSIBLE WITHOUT DISTURBING CONNECTIONS

meter has an inclosed non-spillable ink-well, a removable pen tube and an inclosed damping device. One of the advantages of this instrument is that the ink-well and damper may be filled from the outside. This model "MS" is made in direct-current voltmeters, direct-current wattmeters, alternating-current voltmeters, alternating-current ammeters and wattmeters, pressure recorders, vacuum recorders and speed recorders. They are also made in wall and switchboard types.

Evenly Heated Electric Iron

Perfect balance and even heat are two of the features claimed for a domestic electric iron manufactured by the National Electric Heating Company, Ltd., Toronto, Canada. This device, as shown in the accompanying illustration, has its sole plate and top polished and nickel-plated. The cord on this iron is securely held to take the strain

PERFECTLY BALANCED ELECTRIC IRON

off the contacts, and the terminal studs are mounted on a bracket fastened to the compression plate holding them rigid and properly aligned. The compression plate is machined flat, and when fastened down with two heavy screws the element is held in place with perfect compression. The one-piece leaf unit element, it is claimed, is very efficient and has long life.

Trade Notes

Navy Department Contracts

The Bureau of Supplies and Accounts of the Navy Department has placed contracts as follows:

Aug. 8, 1918—Chesapeake & Potomac Telephone Company, Washington, D. C., telephone line; Denby Motor Truck Company, Detroit, Mich., motor trucks; Studebaker Corporation, Detroit, Mich., motor trucks; Colorado Portland Cement Company, Portland, Cal., cement; George B. Lessig Company, Pottstown, Pa., nails, boat; U. M. Selling Company, New York City, copper; General American Tank Car Company, Chicago, flat cars; Sullivan Lumber Company, Portland, Ore., box lumber; Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., boots; P. B. Yates Machine Company, Beloit, Wis., band saws.

Aug. 9, 1918—Westinghouse Electric & Manufacturing Company, Washington, D. C., radio receivers; Bayley Manufacturing Company, Milwaukee, Wis., ventilating sets; Lunkenheimer Company, Cincinnati, Ohio, grease cups; Bowen Products Company, Auburn, N. Y., grease cups; Michigan Lubricator Company, Detroit, Mich., grease cups; American Injector Company, Detroit, Mich., grease cups; Government Printing Office, supply officers' manuals; Cauldwell-Wingate Company, New York City, steel building; Hyatt Roller Bearing Company, New York City, hangers; Doehler Die Castings Company, Brooklyn, N. Y., bronze castings; Philip Carey Company, Lockland, Ohio, covering magnesia; Franklin Manufacturing Company, Franklin, Pa., felting, asbestos; National Magnesia Manufacturing Company, Redwood, Cal., blocks magnesia; Wallace & Gale, Baltimore, plaster, asbestos; Sall Mountains Company, Chicago, paper, asbestos; O. A. Dauzenbaker, Washington, cement; Ideal Electrical & Manufacturing Company, Mansfield, Ohio, electrical equipment; Carrol Electric Company, Washington, electrical equipment; Dodge Sales & Engineering Company, Philadelphia, Pa., electrical equipment; International Nickel Company, Bayonne, N. J., monel metal; Union Petroleum Company, Philadelphia, Pa., petroleum; Armour & Company, Chicago, tallow; Simplex Electric Heating Company, Cambridge, Mass., electric flatirons; H. I. Dakin, New York City, electric tool kits; Simplex Electric Heating Company, Cambridge, Mass., portable heaters; Holt Manufacturing Company, Peoria, Ill., ports; W. C. Davis Lumber Company, Chicago, Ill., oak; Ed. L. Davis Lumber Company, Louisville, Ky., ash; C. C. Mengel & Brothers Company, Louisville, Ky., mahogany; Fairbanks Company, Washington, D. C., lathes; Consolidated Car Heating Company, Albany, N. Y., foot warmers; Lawrence Sperry Aircraft Company, Brooklyn, N. Y., parachutes; Carnegie Steel Company, Washington, sheet steel.

CHANGES IN ENEMY TRADING LIST.—The War Trade Board announces several additions to the enemy trading list of date of Aug. 23, 1918.

RECLAMATION SERVICE WANTS HYDRAULIC TURBINES.—Sealed proposals will be received by the United States Reclamation Service, Department of Interior, Denver, Col., until Oct. 1, 1918, for furnishing 5000-kw. vertical hydraulic turbines and generators. The number of this proposal is 5370.

EXHIBIT OF FOREIGN ELECTRICAL GOODS AT NEW YORK.—At the district office of the Bureau of Foreign and Domestic Commerce, in room 734 of the New York Custom House, there is now on display a large collection of samples of electrical goods used in foreign countries. The exhibit includes wiring devices, heating appliances, electrical porcelain, dry cells, flashlamps, electric bells, conduit and conduit fittings, insulated wire, etc. There are several hundred articles in the exhibit, and these have been especially arranged for inspection by electrical manufacturers and exporters in order that they may make a personal study of the classes of goods with which their products come into competition abroad. Mr. Lundquist, who conducted the investigations in Australia, New Zealand and the Far East, will be in New York during the week and will discuss with visitors the various items in the exhibit and electrical practices in different countries.

GOVERNMENT TO STUDY LABOR TURNOVER.—Helping to reduce labor turnover as well as to supply unskilled labor for war production is a feature of the central war labor-supplying program conducted through the United States Employment Service of the Department of Labor. This double-barreled work of the Employment Service began recently when a representative of the Employment Service and an expert in industrial management visited one of the largest war projects in the country, which has had an excessive turnover, to see what can be done to keep the men at work. This plant, whose officials are working with the Employment Service and invited it to make the investigation, is now calling for 2000 unskilled workers a week, owing to the constant change and leaving of men. By remedying conditions which cause this instability of the unskilled working force, a part of the men now needed can be used to supply other important and short-handed war industries. A general cutting down of turnover will greatly increase the immediately available supply of unskilled workers for war production. While the institution of government control has checked the rushing of workers from one point to another by private recruiting agents and thereby reduced turnover to a considerable extent, a further cut can be made by the remedying of internal conditions in plants responsible for the quitting of employment by men after a few days or weeks. Administrative officers of the Employment Service at Washington are going into the field themselves to expedite the working of the national machinery of the service and to speed up relief for war industries.

HOW TO OBTAIN CONTRACTS FOR GOVERNMENT SUPPLIES.—In order that all manufacturers and the public generally may obtain full information regarding the needs of the War Department, the General Staff has prepared a plan for obtaining publicity of lists of all articles purchased by any supply bureau. Any manufacturer in the United States who wishes to manufacture government supplies should send his name to the supply bureau purchasing the kind of supplies which he manufactures and indicate what he is in a position to furnish. His application should be accompanied by satisfactory references from banks or reputable business concerns or from the chairman of the local regional manufacturers' organizations associated with the War Industries Board. If found satisfactory his name will be placed on the mailing lists of the bureau which handles the supply in which he is interested. Whenever the bureaus need supplies they will send circular proposals to all persons on their mailing lists interested in the desired supplies, inviting them to submit bids. These bids will be opened and given publicity at such time and place as may be specified by the bureau inviting them. There will also be full publicity of awards. Only in cases where it is decided that valuable information could be transmitted to the enemy will information about supplies and contracts be withheld. The final determination of what is of military value will be decided by the military censors and not by the officers or persons handling the supplies in the bureaus. As a further service to the public, each supply bureau will maintain one or more information desks where there will be available information as to the officers handling the articles purchased by the bureau, together with blanks for proposals and a bulletin board upon which shall be posted all circular proposals. The location of the information desks in each bureau will be published in the *Official Bulletin*. There will also be maintained a central information office at the office of the Director of Purchases and Supplies.

THE METAL & THERMIT CORPORATION announces that the Toronto (Ont.) office of the company has been removed to 15 Emily Street.

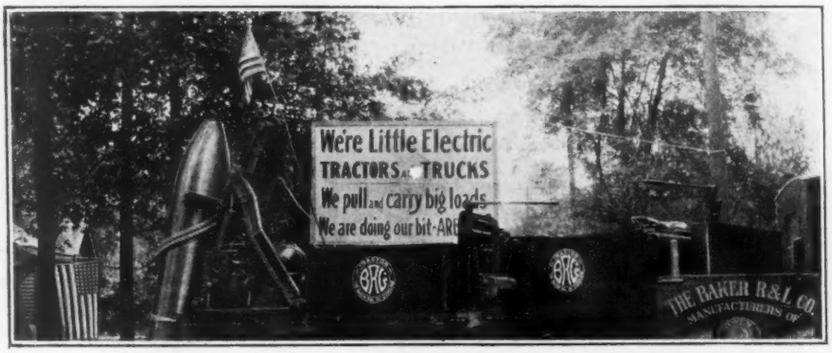
RAEBACH & ZIMPTBAUM have let the contract for the electrical work in their new plant at 16 Eckford street, Brooklyn, N. Y., to I. Stark & Company, 346 Tompkins Avenue, Brooklyn.

THE READING ELECTRIC COMPANY, Chester, Pa., has been awarded a contract for electric wiring, etc., in the office building being erected by the Sun Oil Company, Marcus Hook, Pa., at a cost of $25,000.

SMITH & HOWLEY, 250 Wyoming Avenue, Scranton, Pa., have been awarded the contract for electrical work in connection with a new fifty-thousand-dollar church to be erected on South Elmer Avenue, Sayre, Pa., and for a new school building at Throop, Pa., to cost $25,000.

THE COLORADO LIGHT MANUFACTURING COMPANY, INC., has received authorization to operate in New York for the manufacture of radio luminous compounds and allied products. E. D. Davis, 558 West 158th Street, will act as local representative.

THE BAKER R. & L. COMPANY, of Cleveland, Ohio, manufacturer of Baker and Rauch & Lang electric passenger cars and Owen Magnetic passenger cars, recently developed a comprehensive line of electric industrial trucks and tractors. The accompanying photograph illustrates two types of the Baker R. & L. Company's elec-



tric industrial trucks and tractors carried on an electric commercial vehicle in the loyalty parade held in Cleveland July 4. One of the trucks is shown carrying a large projectile.

THE CYNTHIANA (KY.) PLUMBING & ELECTRICAL COMPANY, of which J. F. and S. O. Nooe were the chief owners, has filed a voluntary petition in bankruptcy. Liabilities are given at $3,200, and it is thought that the stock of the company will bring about $6,000. Business conditions are given as the cause of the failure, the unusual dearth of building operations and the inability to secure competent workmen. Judge T. E. King is in charge of the affairs of the company. J. F. Node has resumed his former position with the Kentucky Utilities Company.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., states that it is permanently discontinuing the manufacture of armored cable, armored cord and flexible steel conduit, schedules "X" and "Y." This step was taken so that it could devote its entire energy to other lines, including a large amount of government business direct and indirect, as well as the externally operated line of knife switches. The company, therefore, has found it necessary to cancel all orders for amored cable, armored cord and flexible-steel conduit in the works, and no further orders can be taken.

THE HOSKINS MANUFACTURING COMPANY, Detroit, has let contracts for the construction of two additional factory buildings. One of these is an extension to the foundry and is of the brick and steel type, 60 ft. by 185 ft. It will provide increased facilities for melting chromal alloys used in the manufacture of thermocouples and resistance wire in electric furnaces and other electrically heated devices. The other building will be used for the manufacture of electric heat-treating furnaces and pyrometers. This structure is of reinforced concrete, two stories high, 60 ft. by 195 ft.

THE MALONEY ELECTRIC COMPANY, manufacturer of transformers, announces the appointment of E. G. Howard as district manager of the Minneapolis office. Mr. Howard has been intimately connected with the electrical industry in the Northwest for many years.

THE LANCASHIRE DYNAMO & MOTOR COMPANY OF CANADA, LTD., says that on Sept. 1, 1918, its head office and works will be on the southeast corner of Niagara and Bathurst Streets, Toronto. The works will be equipped to handle repairs and rewinding of all types of electrical machinery efficiently.

THE ELECTRICAL TESTING COMPANY, 350 Knoxville Avenue, Peoria, Ill., announces that within the next two weeks it will occupy its new electrical and battery service station, which will be used for the electrical work on automobiles exclusively. The building is 60 ft. by 150 ft., one side being devoted to the office and shop and the other side to parking cars.

THE MOHAWK ELECTRICAL SUPPLY COMPANY of Syracuse, N. Y., has recently installed a home appliance department in charge of J. L. Merriott. This department handles all sales in Syracuse of home appliances such as washers, ironers, cleaners, etc. The salesmen in this department are equipped with cars for delivery and demonstration of apparatus handled by the department.

THE COLLYER INSULATED WIRE COMPANY, INC., Pawtucket, R. I., has recently been reincorporated with increased capital. The new officers are: President, H. W. Fitz; treasurer and general manager, R. C. Moeller; secretary, D. S. Davis; superintendent, George T. Jones. The first three named were associated with the American Steel & Wire Company in the electric cable division for many years.

THE AUTOMATIC RECLOSING CIRCUIT BREAKER COMPANY, Columbus, Ohio, announces the appointment of C. M. Hickle as sales manager of the company. For the last two years Mr. Hickle has been connected with the Pittsburgh sales office of the Cutler-Hammer Manufacturing Company. Previous to that time he was engaged in practical and technical work, which has given him excellent preparation for his new duties in promoting the use of automatic protective devices for direct-current equipment of railway substations.

VANCE McCARTY, for the last twelve years manager of the Pittsburgh branch of the Edw. R. Ladew Company, Inc., has been appointed general sales manager of the company, with headquarters in the New York office, 54 Franklin Street. Mr. McCarty's connection with the Ladew company covers a period of eighteen years, the first six of which were spent in the factory in the actual manufacture of Ladew leather belting. Mr. McCarty has made many notable installations of Ladew belting involving difficult and unusual transmission problems.

THE CHICAGO (ILL.) PNEUMATIC TOOL COMPANY announces that the contract has been let and work started on the erection of an up-to-date addition to its Cleveland plant, which is planned to double the present output. It is expected that work will be completed on the building itself about Nov. 1. The necessary equipment has been ordered and it is believed will be delivered and ready for installation by the time the building is completed, so that shortly thereafter the additional production contemplated will be available.

ALFRED I. DU PONT, chairman of the Allied Industries Corporation, 151 Fifth Avenue, New York, has given out the reason for obtaining the Grand Central Palace at New York for the advancement of foreign trade of the United States. Mr. du Pont says the purpose of acquiring the Grand Central Palace for the home of the Allied Publicity Corporation was and is to establish a point of contact between the commercial United States and the rest of the world in the development of foreign trade. This is essentially an after-the-war activity, and as it has now appeared that the government desires the building for hospital purposes, it will be given to the government for the duration of the war. Mr. du Pont says that foreign trade is not a one-sided matter. It does not consist solely of selling products to other countries—it consists of selling to them and buying from them reciprocally. It consists, further, in the establishment through trade relations of greater international understanding and of appreciation for permanent business alliances with other nations and other peoples which will result in closer relations. He thinks that through the plans the corporation is developing alliances made for purposes of war will be cemented and strengthened for the years that are to follow. The general plans laid down for the Allied Industries Corporation were formulated to coöperate very closely with the various domestic and foreign trade bureaus of the government and to work in harmony with various international foreign trade bureaus of allied and neutral governments.

Trade Publications

PORTABLE LAMPS.—The Retherford Brothers Company, Muncie, Ind., is circulating a folder describing and illustrating its "Reth-Flex" lamp, which can be easily moved and the light focused to any position.

HEATING APPLIANCES.—The G. E. Division of the Edison Electric Appliance Company, Chicago, has issued a bulletin describing and illustrating heating appliances. The booklet is well illustrated with reproductions of the various appliances made by this company.

ELECTRICAL SPECIALTIES.—Catalog No. 6, describing, illustrating and listing numerous electrical specialties, has been issued by the Duncan Electrical Company, Ltd., Montreal, Canada. Definitions of electrical units and other valuable information are contained in this booklet.

RUBBER GLOVES.—"A Treatise on the Testing of Rubber Gloves for Dielectric Strength" is the title of a booklet that has been published by the Pittsburgh Glove Manufacturing Company, 413 South Main Street, Pittsburgh, Pa. This company is the maker of "Free Flex" lineman's rubber gloves. A diagram of connections for a simple testing equipment is given and the apparatus that must be used for testing is produced in detail. Methods of testing and reasons for testing are also given.

INSULATION OF COMMUTATORS.—The Mica Insulator Company, 68 Church Street, New York, with works at Schenectady, N. Y., has issued a bulletin entitled "The Insulation of Commutators," containing facts relative to this subject and a discussion of insulation in general. Early methods of insulation are also discussed, and a résumé of the invention of "Micanite" is given. Mica films, cement content of micanite and the different kinds of mica plate are also treated of. The characteristics of "micanite," including its uniform thickness and density, high specific weight, extremely low compressibility, very small cement content and large area of individual mica films, are also outlined.

METERS.—Type MS ampere-hour meters are the subject of bulletin 48 that has been issued by the Sangamo Electric Company, Springfield, Ill. These meters, which can be used for farm-lighting batteries, are well described in the booklet. Various methods of battery charging are described and battery losses are discussed. The principles of the "Mercury" motor meter are given, including the elements of the meter, which are illustrated—the current indicator, contacts, etc. The reverse-current time-limit relay is also described, and the commercial application of the meter in isolated plants, electric vehicles, electric trucks and wireless outfits is given. The dimension diagrams are shown in detail.

WIRING DEVICES AND CIRCUIT BREAKERS.—Catalog 1B, on wiring devices and circuit breakers, is now being distributed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This is a 224-page catalog listing fuses, knife switches, service switches and boxes, solderless connectors, disconnecting switches, instrument switches, safety switches, safety panelboards and carbon circuit breakers, part of which have previously been listed in catalog 3001 of this company. The carbon circuit breakers are listed in this catalog according to what they will accomplish—that is, according to the method of operation, the method of mounting and their rating—the type designation being of secondary consideration. An entirely new and complete line of knife switches of the Westinghouse company's own manufacture for both front and rear connectors occupies forty-nine pages of the catalog.

New Incorporations

THE HARTLAND (MICH.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $2,000.

THE MISSISSIPPI ELECTRIC COMPANY of Jackson, Miss., has been incorporated with a capital stock of $15,000 by J. J. Murphy and T. B. Gaddis.

THE TEAL LIGHT & POWER COMPANY of Chesterfield, S. C., has been incorporated by D. T. and E. Teal. The company is capitalized at $10,000 and proposes to generate and distribute electricity.

THE WELLERSBURG ELECTRIC COMPANY of Meyersdale, Pa., has been incorporated with a capital stock of $25,000 to operate an electric lighting plant in Meyersdale. F. E. Rowe is interested in the company.

THE ELECTRIC GUN COMPANY of Seattle, Wash., has been chartered with a capital stock of $250,000 to do a manufacturing business. The incorporators are R. L. Christensen, F. A. Andrews and C. E. Winberg.

THE SOUTHPORT (N. C.) ELECTRIC LIGHT & POWER COMPANY has been chartered with a capital stock of $30,000 by Mrs. E. M. Suppleyea of Southport; G. W. Suppelyea and William M. Bellamy of Wilmington, N. C.

THE U. S. DEVICES CORPORATION, New York, has been incorporated with a capital stock of $5,000 to engage in the manufacture of electrical goods. J. H. Betts, A. T. Holbrook and L. Hengerer, New York, are the incorporators.

THE THOMSON (GA.) LIGHT & WATER COMPANY has been incorporated by R. L. Hardaway, B. F. Johnson and G. W. Lokey. The company is capitalized at $70,000 and proposes to operate an electric plant in Thomson.

THE DOMESTIC ELECTRIC COMPANY of Birmingham, Ala., has been incorporated with a capital stock of $10,000 to deal in electrical specialties. William C. Knoph of Birmingham, Ala., is president, and F. K. Rungan of Atlanta, Ga., is secretary.

THE MAGNETO IGNITION COMPANY, Tulsa, Okla., has been incorporated by O. R. and H. Wohlauf and J. P. O'Meara. The company is capitalized at $10,000 and proposes to engage in the manufacture of ignition specialties of various types.

THE HIGH-PRESSURE FITTING & VALVE COMPANY, INC., New York, has been incorporated with a capital stock of $25,000. The incorporators are J. W. Naughton, 1385 Union Street, Brooklyn; P. F. Hagan, 216 William Street, and J. A. Hardman, 27 William Street.

THE REPUBLIC LIGHT, HEAT & POWER COMPANY, Buffalo, N. Y., has filed articles of incorporation with a capital of $400,000 to operate a plant for the generation and distribution of electric power. F. M. Lowry, H. R. Davis and H. D. Williams, Buffalo, are the incorporators.

THE MACFARLANE COMMUNICATIONS CORPORATION, New York, has been incorporated with a capital of $1,000,000 under Delaware laws to manufacture and operate telephone and communicating systems. J. B. Lieberman and L. F. Browning, New York, and J. G. Gray, Wilmington, Del., are the incorporators.

THE SAFETY ELECTRICAL MANUFACTURING COMPANY of Sioux City, Ia., has been incorporated by C. B. Chrysler, Morton S. Nelson and H. E. Trowbridge. The company is capitalized at $100,000 and proposes to take over the plant of the Liberty Cartridge Company, which was recently dismantled.

THE VACUUM MUFFLER CORPORATION OF AMERICA, New York, has been incorporated with a capital of $200,000 to engage in the manufacture of muffler appliances, motors, autos, etc. Incorporators: E. Christopherson, 154 Nassau Street; T. L. Thompson, and L. E. Johnson, 27 William Street, New York City.

THE FURMAN-FISHER CORPORATION of New York, N. Y., has been incorporated by L. A. Watkins, G. B. Furman and W. C. Davis, Seventy-second Street and Riverside Drive, New York City. The company is capitalized at $10,000 and proposes to do a general electrical and mechanical engineering business.

New England States

ASHLAND, N. H.—The municipal electric plant was destroyed by fire on Aug. 20, causing a loss of about $50,000. The town recently took over the property of the Ashland Electric Light Company and made extensive improvements.

DANA, MASS.—The committee appointed by the town to make investigation relative to lighting the town by electricity has asked the Gardner Electric Power Company for estimates of cost and other information in connection with the erection of the proposed extension from Petersham to Dana.

SHERBORN, MASS.—Plans, it is reported, have been prepared for the construction of a large power plant, to cost about $70,000, at the Sherborn Reformatory for Women. Mrs. Jessie D. Hodder is superintendent.

UXBRIDGE, MASS.—The contract for the construction of the extension to the power house, boiler house and other additions to the local power plant of the New England Power Company has been awarded to the E. D. Ward Company, 82 Foster Street, Worcester. The proposed improvements will cost about $1,100,000 and will include boilers, condensers and turbo-generating units to develop 17,500 kw. In addition to these improvements the New England company is planning to erect an electric transmission line from Millbury to Norwich, Conn., a distance of 60 miles, to cost approximately $350,000.

HAZARDVILLE, CONN.—Plans are being prepared by Ford, Buck & Sheldon, mill engineers, of Hartford for the construction of a new power house for Gordon & Gordon. The building will be 20 ft. by 50 ft., two stories, with gatehouse, intake and spillway. The equipment will include turbines and generators, which, it is understood, have been purchased.

NEW HAVEN, CONN.—The New York, New Haven & Hartford Railroad Company, it is reported, has decided to adopt electric headlights to replace the old oil-burning type on its locomotives. The new lamps will be put into use as soon as possible.

NEW LONDON, CONN.—Contract has been awarded to the R. R. Bill Company, Springfield, Mass., for the construction of the new boiler plant and heating system at the local navy yard.

Middle Atlantic States

CANISTEO, N. Y.—The Hornell (N. Y.) Electric Company is reported to be negotiating for the property of the Canisteo Light & Power Company.

ELLIS ISLAND, N. Y. HARBOR.—Contract has been awarded to J. A. Almirall & Company, 1 Dominick Street, New York City, by the United States government, Bureau of Immigration, for alterations and improvements to the main power plant at local hospital.

GALVAY, N. Y.—Plans are under consideration by the board of managers for the installation of extensions to the power plant, to cost about $12,000, at the Saratoga County Homestead Sanitarium.

GENEVA, N. Y.—Plans have been prepared for the construction of a new municipal boiler plant, to cost about $15,000. J. W. Brennan is city engineer.

GROTON, N. Y.—The Ovid (N. Y.) Electric Company has petitioned the Public Service Commission for permission to acquire the capital stock of the Groton Electric Light Corporation. If the petition is approved, the Ovid company will furnish electricity in the town of Lansing. A further reason for the consolidation of the companies is the erection of an electric transmission line from the plant of the Ovid company across Cayuga Lake and the town of Lansing to the Groton town line, and the construction by the Groton company of a similar line across the town of Groton to the same point.

JAMESTOWN, N. Y.—The Water and Light Commission has given Mayor Carlson authority to secure a franchise to furnish electricity in the village of Falconer from the municipal electric light plant.

JAMESTOWN, N. Y.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 11, for conduit and wiring and lighting fixtures in the United States post office at Jamestown.

MALONE, N. Y.—Bids will be received by Captain John A. Coffey, secretary board of armory commissioners, 158 Capitol Street, Albany, until Sept. 18 for addition to State Armory, including construction, heating, electric and sanitary work. Drawings and specifications may be consulted at the above office, at the New York office of the Department of Architecture, Room 1224 Woolworth Building, and at the Department of Architecture, Capitol, Albany. Lewis F. Pilcher is state architect.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEW YORK, N. Y.—The Cantonment Division, War Department is planning to build an extension to the Greenhut Building, to cost about $306,000.

NEW YORK, N. Y.—The construction of a naval hospital on Ward's Island, to cost about $1,000,000, is under consideration (Specification 3338) by the Bureau of Yards and Docks, Navy Department, Washington, D. C.

ROCHESTER, N. Y.—Plans are under consideration by the Bridgeford Tool & Machine Works, Winton Road North, for the construction of a power plant at its works.

BROWN MILLS, N. J.—Negotiations have been completed by the Brown Mills Electric Light & Power Company for the plant of the Brown Mills Company, at $10,000, to be used for extensions.

CAMDEN, N. J.—The Board of Public Utility Commissioners has approved an agreement between the Public Service Railway Company and the Emergency Fleet Corporation for the construction of an electric railway between the shipyards of the New York Shipbuilding Corporation and the Yorkship Village. The new line will connect with the present system of the Public Service Railway Company at Broadway and Warren Streets, Gloucester City. The cost is estimated at $219,947.

NEWARK, N. J.—A machine shop, forge shop, electrical and other departments will be installed in connection with the new vocational school to be built by the board of education in Newark. The proposed building will be 250 by 250 ft. and will cost about $500,000.

TRENTON, N. J.—The American Steel & Wire Company, Hamilton Avenue, is contemplating the erection of a pumping plant at its works, for which plans have been prepared.

BEAVER BROOK, PA.—The installation of new electrically operating pumping machinery at its No. 5 colliery is under consideration by the C. M. Dodson Coal Company. Two units of large capacity will be installed.

BETHLEHEM, PA.—Contract has been awarded by the Philadelphia & Reading Railway Company for the erection of a new power plant and engine house, about 100 ft. by 200 ft. and 35 ft. by 75 ft. respectively, to be located on Saucon Creek in the Didur district, to the Roydhouse-Arey Company, 112 North Broad Street, Philadelphia.

COATESVILLE, PA.—Application has been made to the Public Service Commission by the Chester Valley Electric Company for permission to take over and operate the plant of the Downington Electric Company.

PHILADELPHIA, PA.—The contract for electric wiring for a light and power system for the McKean Street pier now being completed on the Delaware River has been awarded to the United States Electric Construction Company, at $40,000.

PHILADELPHIA, PA.—Contract has been awarded by the Pennsylvania Railroad Company for the construction of a new plant at Greenwich Point, South Philadelphia, Pa., consisting of a machine shop, engine house and auxiliary shops, oil houses and storage buildings, to Irwin & Leighton, Twelfth and Cherry Streets. The company has also awarded contract for construction of new shops, etc., at Morrisville, to cost about $300,000, to the Braun & Stuart Company, Commercial Trust Building.

PITTSBURGH, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept 9 for mechanical stokers, etc., in the United States post office and court house at Pittsburgh.

PITTSBURGH, PA.—Contracts have been awarded by the United States Steel Corporation, acting for the United States government, to the Westinghouse Electric & Manufacturing Company of Pittsburgh for three 15,000-kw. generators for a generating plant to cost approximately $5,000,000, which will be used in connection with the government ordnance plant now being erected in Neville Island.

SCRANTON, PA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 12 for conduit and wiring and lighting fixtures in the United States post office at Scranton, Pa.

STEELTON, PA.—The Bethlehem Steel Company is contemplating the installation of a large turbine in its power plant near Locust Street.

HARTLAND, W. VA.—The Hartland Power Company, which is planning to erect a high-tension transmission line along the Elk River to Charleston, 5 miles, is also considering building a transmission line from its power station along the Elk River in the opposite direction, a distance of 4 miles, to serve a number of coal mines and the town of Clay. Part of the line toward Charleston is under construction. The power station of the company is located on the Elk River, 47 miles from Charleston, and at present serves several coal mines along Middle Creek. W. S. Barstow & Company, 50 Pine Street, New York, N. Y., are managers.

RIVESVILLE, W. VA.—The Monongahela Valley Traction Company is contemplating a loan of $2,500,000 to complete work under way, including the Rivesville power plant, gas-producer plant, gasoline plant, drilling gas wells, laying gas mains, extension of transmission lines, developing coal lands, sinking two shafts for mines and building twenty-five houses.

RICHMOND, VA.—The City Council has appropriated $12,000 for extensions to the municipal electric light plant. The municipal power station will supply electricity to the government boiler plant.

WASHINGTON, D. C.—The Potomac Electric Power Company, it is reported, is contemplating an issue of $2,100,000 in bonds for improvements to its electric generating and transmission systems.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Sept. 3, for five electric traveling cranes for Washington, under Specification 3309.

WASHINGTON, D. C.—The Bureau of Yards and Docks, Navy Department, is planning to install an electric distributing system at Coddington Point (Specification 3339), to cost about $75,000. Also underground wiring at Montauk Point, N. Y., to cost about $6,575, Specification 3338.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 9, for furnishing at the various navy yards and naval stations supplies as follows: Cape May, N. J., Schedule 5477½—one shaper, one portable boring bar, and one alternating-current motor. Philadelphia, Pa., Schedule 5539½—Six portable electric drills; Schedule 5604½—4000 storage batteries; Schedule 5607½—10,000 storage batteries. Newport, R. I., Schedule 5605½—150 reels of single-conductor cable; Schedule 5609½—two induction motors. Washington, D. C., Schedule 5579½—2000 ft. enamel conduit and a quantity of single-conductor and control cable; Schedule 5606½—6120 lb. brass tubing. Applications for proposal blanks should give the schedule desired by number.

North Central States

ALMA, MICH.—The City Council has authorized a contract with the Central Michigan Light & Power Company of Mount Pleasant to furnish electricity for pumping the pure well-water supply for a period of five years. Fifteen wells are being sunk to supply this service.

DETROIT, MICH.—Bids are being received by the W. J. Hartwig Company, Jefferson Avenue, for the construction of three-story and basement building, 70 ft. by 100 ft., at Jefferson Avenue and Fifteenth Street. The company manufacturers electric fire-alarm boxes.

BLOOMDALE, OHIO.—At an election held recently the proposal to issue bonds for the installation of a municipal electric light plant was carried.

CINCINNATI, OHIO. — Announcement has been made by the officials of the Columbia Gas & Electric Company that contract has been closed between the Union Gas & Electric Company, the operating subsidiary of the Columbia Company, and the United States government for supplying electricity for operating the large government nitrate plant to be erected near Cincinnati. The proposed plant has now been definitely located at Broadwell, instead of at Elizabethtown, as had been tentatively considered. The contract calls for a maximum of not less than 30,000 kw. or in excess of 40,000 kw., not later than July 1, 1919.

DEFIANCE, OHIO.—The Defiance Gas & Electric Company is contemplating the installation of an additional electric generating unit of 5000-kw. rating. The plans provide for an addition to the power station.

NORWALK, OHIO.—The City Council is considering an issue of $25,000 in bonds for the installation of a 500-kw. generator for the municipal electric light plant.

RICHMOND, OHIO.—Plans are under consideration by the Chesapeake & Ohio Railroad Company for extensive additions at its local shops, including the erection of a new power plant.

MIDDLESBORO, KY.—The Middlesboro Lumber Company is reported to be considering the purchase of a 500-kw., 2200-volt Curtis generator set (second-hand).

DECATUR, IND.—An ordinance has been passed by the City Council authorizing the extension of the municipal electric lighting system to the towns of Bolo and Pleasant Mills. The lines from the city limits will be erected by the Pleasant Mills Light & Water Company.

CAMERON, ILL.—The power plant of the Rock Island Southern Traction Company was recently destroyed by fire. Arrangements, it is understood, have been made with the Galesburg Railway, Lighting & Power Company to obtain power to operate its system. The entire equipment as well as buildings was destroyed.

MAHOMET, ILL.—The installation of an electric lighting system in Mahomet is reported to be under consideration. Electricity will probably be supplied by the Illinois Traction System.

SADORUS, ILL.—Plans, it is reported, are being considered for the installation of an electric lighting system in Sadorus. Energy will probably be secured from the Illinois Traction System.

WAUKEGAN, ILL.—Work has started on the construction of an extension to the local plant of the Greiss Pflege Tanning Company, 170 ft. by 140 ft. The power plant will also be enlarged. The cost of the entire work is estimated at about $300,000.

WEST FRANKFORT, ILL.—The Peabody Coal Company is contemplating equipping its mines, Nos. 18 and 19, for electrical operation. At mine No. 19 a 450-kw. generator driven by a Corliss engine and two boilers will be installed. A similar generator, or possibly larger, will be installed at Mine No. 18.

BRODHEAD, WIS.—The purchase of equipment for the proposed hydroelectric plant is reported to be under consideration by K. Guelson, superintendent of the municipal electric light plant. Plans have been prepared by the Power Engineering Company, Corn Exchange Building, Minneapolis.

MANITOWOC, WIS.—The City Council has appropriated $57,596 for the purchase of additional equipment for the municipal electric light plant and has instructed the Utility Commission to award contracts for the work at once. Contracts for most of the equipment have been let. The new equipment will include a 1500-kw. turbine, a 300-hp. boiler, switchboard, etc.

MILWAUKEE, WIS.—Bids will be received by the Sewerage Commission, City Hall, Milwaukee, until Sept. 12 for construction and erecting in pumping station to be built on Jones Island, city of Milwaukee, machinery for an automatic electric sewage-pumping plant; including three 30-in. centrifugal pumps, vertical type, three 250-hp. variable-speed, wound-rotor motors, high-tension and electric control apparatus, switchboard and wiring, Venturi meter, cast-iron pipe and specials, gate and check valves, etc. Specifications and proposal blanks can be obtained at the office of the Sewerage Commission upon deposit of $5. John H. Fowles is secretary.

CRESTON, IOWA.—The local electric light plant was recently damaged by fire.

GREENE, IOWA.—Plans are being prepared by the Power Engineering Company, Corn Exchange Building, Minneapolis, for extensions to the power plant of the Greene Electric Light & Power Company.

HUMBOLDT, IOWA.—The Board of Railroad Commissioners has granted the Northern Iowa Gas & Electric Company a franchise to erect an electric transmission line, 6¼ miles long, over the highways of Clay County to the limits of the town of Dickens for a period of 25 years. The company was also granted a 25-year franchise to construct and operate a transmission line on the roads and highways of Palo Alto County. A. S. Harrington of Humboldt is manager of the company.

WALCOTT, IOWA.—The Farmers' Electric Line Company of Walcott has been granted a franchise by the Board of Railroad Commissioners to erect an electric transmission line, 2.6 miles, over the roads and highways of Scott County for a period of 25 years. Albert Blank of Walcott is interested in the company.

APPLETON, MO.—Bonds to the amount of $15,000 have been voted for improvements to the municipal electric lighting plant. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are engineers.

HOLDEN, MO.—The City Council has decided to purchase electricity from the plant at Pleasant Hill instead of rebuilding the municipal electric plant.

RICHMOND, MO.—The city of Richmond is considering the purchase of a centrifugal pump and a triplex pump, both motor-driven.

MUNICH, N. D.—The installation of an electric lighting system in Munich is reported to be under consideration.

MADISON, S. D.—The municipal electric lighting plant, recently destroyed by fire, will be rebuilt. The loss is estimated at about $100,000.

KIMBALL, NEB.—Bonds to the amount of $17,000 have been voted for the installation of a municipal electric lighting plant.

STERLING, NEB.—Arrangements are being made by the Nebraska Electric Lighting Company to rebuild its local plant, recently destroyed by fire.

Southern States

ANDERSON, S. C.—The construction of electric light, sewer and water systems for the mill village is reported to be under consideration by the officials of the Orr Mills.

CHESTERFIELD, S. C.—The Teal Light & Power Company, recently incorporated, is planning to install a power plant to develop about 300 hp. The plans include the erection of a 6-mile transmission line. J. Newton Johnson of Wilmington, N. C., is engineer.

ATLANTA, GA.—The House of Representatives has passed the bill appropriating $10,000 for the Georgia Technical School, to be used for the completion of the power plant which is already under construction.

LABELLE, FLA.—The installation of an electric light plant in Labelle is under consideration. C. W. Shaefer and others of Cleveland, Ohio, are reported interested in the project.

TALLAHASSEE, FLA.—The installation of an lectric light plant, deep well and cold storage plant on its property is contemplated by the Leon Hotel Company.

NEWPORT, ARK.—The Arkansas Light & Power Company is contemplating the erection of an electric transmission line to furnish electricity in Tuckerman. The company will also furnish electricity to the city of Newark, 14 miles distant.

MONROE, LA.—The Standard Warehouse & Compress Company is contemplating the purchase of two boilers and other power-plant equipment, to cost about $15,000.

PONCA CITY, OKLA.—Extensions to the waterworks system, to cost about $75,000, are under consideration. The plans include the installation of an engine and generator to develop about 500 hp. and the construction of a small concrete dam. Burns & McDonnell, Kansas City, Mo., are engineers.

ATLANTA, TEX.—The electric power and ice plant of the Gulf Public Service Company was recently destroyed by fire, causing a loss of about $20,000.

DALLAS, TEX.—The new contract recently awarded the Dallas Electric Company for lighting the streets of the city provides for the installation of 2500 new street lamps to be installed at once. At present there are 1250 arc lamps, which are to be replaced with the lamps rated at 250, 400 and 600 cp. The 400-cp. lamps will be placed at street intersections and the 600-cp. lamps will be used in the business section after the ornamental lamps are put out. The lamps will be put on meters, and electricity to maintain the service will be furnished the city at cost.

ELECTRA, TEX.—Improvements are contemplated to the water and lighting systems, involving an expenditure of about $25,000.

HOUSTON, TEX.—The Humble Oil & Refining Company of Houston is planning to equip its oil pumping plant in the Goose Creek field with electric motors and to install a central power station to supply the electricity. More than 800 motors will be required. Plans are also being prepared by the company for the construction of an oil refinery in Houston, to cost about $2,000,000.

SAN ANTONIO, TEX.—Contract has been awarded by the War Department to the American Construction Company of Houston for the erection of the new army machine shop at San Antonio, to be used for the repair of automobiles, motor trucks, motorcycles, wagons and other vehicles. The main building will be 500 ft. by 500 ft. The cost of the entire plant is estimated at about $1,500,000.

Pacific and Mountain States

HOQUIAM, WASH.—Improvements are being made to the plant of the Gray's Harbor Lumber Company, including an addition to the power house. New equipment, including a 750-kw. and a 1000-kw. turbine and two high-pressure boilers, will be installed. The sawmill will be equipped for electrical operation throughout.

SEATTLE, WASH.—J. D. Ross, superintendent of lighting, has asked the City Council for authority to purchase a site on Spokane Avenue, between Montana and Wyoming Streets, on which to erect a substation. It is proposed to remove transformers from Yesler station and install two new transformers.

TACOMA, WASH.—The new sawmill to be erected in Tacoma by J. T. Gregory, T. Y. S. Ballantine and E. V. Wintermore will be equipped for electrical operation throughout. The plant will have a capacity of 90,000 ft. daily.

OLNEY, ORE.—The application of John Ryan of Olney for appropriation of water rights in the Clatskanie River sufficient to develop about 300 hp. has been approved by State Engineer Lewis.

BAY POINT, CAL.—The Bay Point Light & Power Company has applied to the State Railroad Commission for permission to issue 440 shares of capital stock (par value $100) to be issued at $80, the proceeds to be used for refunding outstanding indebtedness and for improvements. The company estimates that it will require $33,525 for new substations, meters, street-lighting equipment, etc.

FRESNO, CAL.—Rosenberg Brothers are contemplating the construction of a power plant at their fruit-packing plant on Cherry Avenue, to cost about $10,000.

FRESNO, CAL.—The California Associated Raisin Company is planning to erect an electric power plant at its works at East and California Avenues.

FRESNO, CAL.—Permission has been granted to the San Joaquin Light & Power Corporation to issue $113,000 in bonds, the proceeds to be used for extensions and improvements to its system.

OROVILLE, CAL.—Paul Reicker, civil engineer, of Oroville, is planning to interest the cities of the Sacramento Valley from Sacramento to Red Bluff in a project to construct a large power plant on the middle fork of the Feather River for the purpose of furnishing the municipalities with electricity for lamps and motors. Mr. Reicker claims that a dam 650 ft. high in Bald Rock Canyon would store sufficient water for the irrigation of a large acreage after using the water for power development. The cost of the project is estimated at between $5,000,000 and $6,000,000.

PROVO, UTAH.—Plans are being considered by the Knight Woolen Mills for rebuilding the local plant, recently destroyed by fire, causing a loss of about $350,000.

MESA, ARIZ.—The installation of cluster lamps on streets that are now being paved is under consideration.

LIBBY, MONT.—Extensive improvements are contemplated by the Lukens-Hazel Mining Company, involving an expenditure of about $150,000, which will include the construction of a hydroelectric power plant, installation of mining machinery and a concentrating plant.

STERLING, COL.—The Colorado Power Company is reported to be considering the construction of a large steam-driven electric power plant, to cost about $150,000, on a site recently acquired in Sterling.

ROSWELL, N. M.—The Southern Pacific Company contemplates the erection of new shops in Roswell, to cost between $75,000 and $100,000. W. Hood is chief engineer.

Record of Electrical Patents

Notes on United States Patents

1,271,558. THERMOSTATIC TIME CUT-OUT; John C. Francis, Boston, Mass. App. filed June 16, 1916. May be easily reset to normal position without the necessity of replacement of parts.

1,273,385. ROTATING FIELD MAGNET; Birger Ljungstrom, Stockholm, and Frederick Ljungstrom, Brevik, Lidingon, Sweden. App. filed Jan. 19, 1918. One object of the invention is to obtain the same creep-length by means of a thin bottom insulation as may be obtained by a thicker one and, further, to increase the sectional area of the rotating field-magnet and thus to increase its capacity.

1,273,786. AUTOMATICALLY RECLOSING CIRCUIT BREAKER; Estell C. Raney, Columbus, Ohio. App. filed Aug. 17, 1916. Effective in the protection of motor circuits and particularly desirable in individual motor circuits.

1,273,789. WIRELESS SIGNALING SYSTEM; William C. White, Schenectady, N. Y. App. filed March 2, 1915. Means for modulating or varying the amplitude of continuous electrical waves, especially of such waves in accordance with variations in sound waves.

1,273,798. AUTOMATIC STARTER AND CONTROLLER; Ralph D. Ernest, Ann Arbor, Mich. App. filed Oct. 19, 1916. To operate the generating sets in such a way as to provide current at the proper voltage when there is a demand for the same, and immediately to stop the generating of current when there is no demand for power.

1,273,812. CROSS-BRIDGE X-RAY MACHINE; Paul Berlin, Hoboken, N. J. App. filed July 14, 1916. To produce high-potential and unidirectional as well as oscillatory electric currents for therapeutic use.

1,273,820. ELECTRIC COUNTER; Clarence N. Cahusca, Jersey City, N. J. App. filed March 7, 1917. A novel manner of mounting the armature of the magnet, which is energized to impart the electric counting impulse positively and with a minimum of current.

1,273,821. ELECTRICALLY HEATED COOKING VESSEL; Howard C. Causton, Vancouver, B. C., Canada. App. filed May 4, 1917. The provision of a receptacle within which the heating unit may be removably placed.

1,273,835. TRACK INSTRUMENT; Charles M. Dunham, Edgewood Borough, Pa. App. filed Dec. 14, 1916. Adapted to be operated by the vertical motion of a rail or track when a car or train is passing thereover.

1,273,850. SELECTOR CIRCUIT FOR AUTOMATIC AND SEMI-AUTOMATIC TELEPHONE SYSTEMS; Chas. L. Goodrum, New York, N. Y. App. filed April 27, 1916. To prevent the sending of false impulses through careless removal of the receiver from its hook.

1,273,851. PORTABLE ELECTRIC LANTERN; William Grether, Dayton, Ohio. App. filed Jan. 26, 1918. The handle and casing are so constructed and connected that the batteries may be removed from the latter without disturbing the handle.

1,273,870. ENGINE-STARTING DEVICE; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed July 14, 1913. Relates to a system of devices adapted for supplying power to start an engine, and the engine, when thus started, is arranged to store up power for similar future starting operations.

1,273,871. ENGINE-STARTING SYSTEM; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed Sept. 13, 1913. A system of devices adapted to be combined with combustion or explosion engines.

1,273,880. ENGINE-STARTING DEVICE; Lawrence Langner, Whitestone Landing, N. Y. App. filed July 21, 1913. To prevent the improper actuation of the starting device and the consequent injury to the apparatus, and to avoid the possibility of accidents.

1,273,915. ELECTRODE HOLDER FOR ELECTRIC ARC LAMPS; Harry N. Ott, Buffalo, N. Y. App. filed Sept. 15, 1915. Will securely hold the carbon or electrode and can be readily adapted for holding carbons or electrodes which differ considerably in size.

1,273,920. ELECTRIC FURNACE; Carl A. Pfanstiehl, Waukegan, Ill. App. filed Nov. 19, 1914. A furnace adaptable for use in sintering ingots of tungsten metal in the process of producing ductile tungsten.

1,273,940. RELAY; Benjamin H. Smith, Turtle Creek, Pa. App. filed Dec. 29, 1914. To provide a relay having means for compensating for the torque thereof, under predetermined conditions of operation, and in so doing, to constitute a definite time-limit relay.

1,273,973. AUTOMOBILE REAR SIGNAL; Richard N. Woodman, Chicago, Ill. App. filed July 15, 1916. For attachment on vehicles operated electrically, when the proper circuit is closed, to signal a right-hand or left-hand turn to be made or to indicate stopping or backing of the vehicle to drivers of other vehicles following.

1,274,035. DIFFERENTIAL MICROPHONE; Paul J. Hackett, Seattle, Wash. App. filed Oct. 23, 1916. A carbon cup is provided which is non-packing, air-tight and therefore does not deteriorate.

1724,066. HEAT REGULATOR; Harry C. Mallory, Bellport, N. Y. App. filed March 4, 1915. Electric power is positively applied and controlled for operating valves which in turn control the flow of steam, hot water or other heating fluids through heating systems.

1,274,076. ELECTRIC RAILWAY SYSTEM; Erich J. Patelski, Chicago, Ill. App. filed March 8, 1915. Relates to electric railway systems of that kind in which the current is not conveyed to the moving cars through the medium of a continuous conductor, but simply through the medium of current-feeding contacts disposed along the track.

1,274,094. ELECTRIC SWITCH; James R. Sloan and George H. Liebegott, Altoona, Pa. App. filed July 18, 1916. Device whereby the train operator may signal desired information to the motorman or engineer.

1,274,115. ELECTRIC GENERATORS; Robert M. Warren, Sumter, N. C. App. filed April 21, 1917. Relates to an electric generator which is formed as a part of the flywheel of an engine.

1,274,128. TELEPHONE ATTACHMENT; Joel E. Williamson, Evansville, Ind. App. filed Oct. 8, 1917. Will prevent the telephone cord from wrapping around the instrument or becoming tangled.

1,274,186. METHOD OF CLEANING METAL ARTICLES; Charles B. Morey and Charles J. Huber, Buffalo, N. Y. App. filed June 23, 1917. Improvements.

1,274,202. ELECTRIC-LAMP-SUPPORTING DEVICE; Robert H. Ruth, New York, N. Y. App. filed Nov. 24, 1913. Relates to sockets which are provided with an extension plug adapted to be inserted into a wall fixture, ceiling fixture or the like.

1,274,248. THERMOSTATIC CIRCUIT-CONTROLLING DEVICE; John H. Derby and Ernest S. Clayton, New York, N. Y. App. filed Aug. 10, 1916. Relates to devices of the type employed to indicate marked rises in temperature; for example, in fire alarm signal systems.

1,274,263. COMBINATION HEADLAMP AND FLASHLIGHT; Cameron G. Hamilton, Seattle, Wash. App. filed June 7, 1917. To provide a battery lamp for the head, easily convertible into a pocket flashlight of standard form.

1,274,264. METHOD OF SELECTIVE ELECTRIC-WAVE SIGNALING; John Hays Hammond, Jr., Gloucester, Mass. App. filed April 27, 1912. Selective signaling with undamped waves of periodically varying amplitude at receiving station with means which shall be non-responsive to any vibrations except those having predetermined amplitude variations.

1,274,301. ELEVATOR SIGNAL SYSTEM; Alvin C. McNabb, Dallas, Tex. App. filed Jan. 10, 1917. The floor position signal is set up in each car so that the operator knows just where he is by merely glancing at his indicator and at the same glance observes the floor positions of the other cars in his bank.

1,273,347. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; Herbert L. Fish, Bakersfield, Cal. App. filed May 19, 1906. The object of invention is the provision of an improved and highly efficient common-battery automatic telephone exchange system.

1,274,348. CAR TRUCK; John Taylor, Albany, N. Y. App. filed Jan. 23, 1918. To produce a "low-down" truck having a swing-motion bolster and spiral springs over the journal boxes and elliptic springs on the bolster to support the car body.

1,274,360. MANUFACTURE OF SHAPED CASTINGS OF FERROSILICIDE; Napoleon G. Petinot, New York, N. Y. App. filed July 19, 1916. An iron and silicon alloy with a content of silicon approximating from 10 per cent to 16 per cent.

1,274,367. SIGNAL SYSTEM; Clarence E. Beach, Binghamton, N. Y. App. filed Oct. 1, 1915. Adapted for use in connection with receiving and recording devices which have polarized magnetic mechanisms.

1,274,368. FUSE; Harry L. Beck, Pittsburgh, Pa., John Weible, Coraopolis, and Jerry J. Houlahen, Millvale, Pa. App. filed Oct. 4, 1915. Parts are so arranged that a careless person cannot close up the shell or casing without all the parts being assembled in their proper position.

1,274,380. SOCKET TRANSFORMER; Leo F. Brislin, Ashland, Ky. App. filed Oct. 13, 1917. Detachable transformer-voltage-reducing device for electric light sockets in which the transformer and the conductors between the transformer and the plug and receptacle of the device are entirely inclosed within the insulating body of the device.

1,274,399. LOCOMOTIVE-DRIVING MECHANISM; George M. Eaton, Pittsburgh, Pa. App. filed Dec. 14, 1916. The motors are so disposed relative to the driving wheels that the weight of the driving connections may be greatly reduced and smooth-running characteristics insured when operating at high speeds.

1,274,400. LOCOMOTIVE-DRIVING MECHANISM; George M. Eaton, Pittsburgh, Pa. App. filed Dec. 14, 1916. Connecting means between the propelling motors and the driving wheels of electric locomotives.

1,274,411. COMMUTATOR AND THE METHOD OF MANUFACTURING THE SAME; Edward A. Halbleib and Thomas L. Lee, Rochester, N. Y. App. filed June 26, 1915. Improvements in the structure and the manufacture of the commutators of electric motors, generators or other machines.

1,274,420. SIGNAL; Ferdinand G. Henry, Philadelphia, Pa. App. filed March 13, 1916. For use with automobiles to indicate from the rear or other parts of the automobile the direction in which it is to turn.

1,274,428. INDUCTION COIL; Thomas L. Lee, Rochester, N. Y. App. filed Nov. 1, 1917. Improved construction for connecting the insulated terminal of the secondary winding with a conductor external to the casing in which the windings are inclosed.

1,274,451. CLAMPING MECHANISM FOR WELDERS; Archer W. Richards, Lakewood, Ohio. App. filed May 18, 1917. Designed to replace the heavy manually operable clamps and quickly and accurately clamp ends of metal in abutment for the operation known as butt-welding.

1,274,479. MANUFACTURE OF PHOSPHORUS; Harry O. H. Wenman, Bishop's Castle, England. App. filed Dec. 7, 1917. Running molten slag direct from a steel furnace into an electric furnace, supplying silicate and carbon to the electric furnace, and maintaining the furnace at the temperature required to vaporize the phosphorus.

1,274,489. MOTOR-CONTROL SYSTEM; Reuben I. Wright, Wickliffe-on-the-Lake, Ohio. App. filed April 18, 1917. Two or more motors are mechanically connected to the same load.

1,274,492. CONNECTOR; Frederick Zenker, Highland Park, Mich. App. filed March 29, 1917. To secure a pair of pivoted knife-blade contacts to the cross-head or connecting member of an electric switch.

1,274,493. ELECTRIC CONDUCTOR; Charles W. Adams, Saginaw, Mich. App. filed Feb. 13, 1918. Carbon brushes and a means for attaching flexible conductors or pigtails to carbon brushes, and an improved method of making the connection between the brush and the pigtail.

1,274,514. SIGNAL SYSTEM; Nathaniel B. Creglier, Chicago, Ill. App. filed Jan. 5, 1911. A pair of metallic conductors may be used for each box or substation, the system being thus operable when desired by a completed metallic circuit.

1,274,519. TELEGRAPHY; Patrick B. Delany, South Orange, N. J. App. filed June 1, 1917. Improved means for forming and transmitting telegraphic signals over telephone circuits or other circuits operated through microphone contacts.